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REVUE ALGOLOGIQUE

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Par P. ALLORGE et G. HAMEL

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Professeur-Docteur Wilhelm VISCHER
(1890-1960)

BIBL. DU MUSÉUM D'HIST. NATURE.

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Professeur Docteur Wilhelm Vischer
(1890-1960)

Par G. HUBER-PESTALOZZI (Zürich).

■

Le 2 juin 1960 est décédé à Bâle, des suites d'une affection cardiaque, le Professeur de Botanique Wilhelm VISCHER. Il avait eu la chance de pouvoir célébrer le 5 janvier de la même année, son 70e anniversaire.

Le Prof. VISCHER, né à Bâle le 5 janvier 1890, était fils du Dr Wilhelm VISCHER, avocat-juriste, et notaire bien connu de cette ville, et de Hélène ISELIN. Il descendait donc de deux vieilles familles de Bâle. Avec son frère et ses deux sœurs, il passa une agréable jeunesse. Il fréquenta les écoles élémentaires, puis le Lycée de sa ville natale et alla ensuite suivre les cours de Faculté aux Universités de Genève, de Bâle et de Munich.

Dans cette dernière ville, il obtint en 1914, le grade de Docteur, chez le Prof. GOEBEL maître de la morphologie expérimentale. A l'Université de Genève, il fit la connaissance du Prof. Robert CHODAT avec lequel il entreprit un voyage d'études au Paraguay.

En 1919, VISCHER se rendit à Java, à la Rubber-proef Station où il étudia les plantes à Caoutchouc.

De retour à son pays natal, en 1923, il reprend ses recherches à l'Université et y est nommé en 1924, « Privat-docent » puis en 1928 Professeur extraordinaire en Botanique systématique et pharmaceutique et en géographie Botanique.

VISCHER s'intéresse alors avant tout aux algues d'eau douce, plus rarement et exceptionnellement aux Champignons inférieurs.

Il acquiert rapidement une grande maîtrise dans ce domaine, et crée une riche algothèque, de réputation mondiale.

VISCHER a découvert et décrit un nombre considérable d'algues nouvelles surtout parmi les espèces croissant dans les stations subaériennes (sol, murailles humides, tronc d'arbres, etc...)

Ses travaux scientifiques se distinguent par une grande clarté et une précision remarquable, et de plus dans ses conclusions il reste toujours prudent.

Sa grande expérience des cultures, sa connaissance parfaite de la Taxonomie, lui ont permis d'étudier avec fruit les algues pleurococcoïdes des sols et d'en préciser la place systématique.

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Son important mémoire sur les Chaetophorales est un modèle du genre et reste un ouvrage fondamental sur cet ordre de Chlorophycées. VISCHER, comme dans tous ses travaux, a su allier harmonieusement l'expérience du physiologiste avec celle du naturaliste systématicien.

VISCHER a été longtemps Président de la Société pour la Protection de la Nature en Suisse. Il a d'ailleurs écrit un ouvrage sur ce sujet. Il a présidé aussi la commission de recherches du Parc National Suisse et étudié les algues de cette réserve.

VISCHER était un homme de grande originalité, courageux, et puissant travailleur. N'étant pas marié, il était toujours entouré d'un cercle d'amis qui s'intéressaient non seulement à la Botanique, mais aussi à l'art, à la musique, à la littérature.

De plus VISCHER était un alpiniste passionné, amateur de longues et difficiles courses en montagne.

En l'honneur de ses travaux algologiques, PASCHER en 1938, lui avait dédié un genre de Xanthophycées-Hétérococcales, le genre *Vischeria* avec 7 espèces.

La botanique a perdu avec VISCHER un savant de grande classe qui faisait honneur à la Science désintéressée.

La liste suivante de ses publications algologiques en est la meilleure preuve.

*
**

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Arthur M. Scott
(1888-1963)

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Arthur M. Scott (1888-1963)

by G. W. PRESCOTT.

■

It is not often that an amateur hiologist devotes himself to a hobby so dilligently and with such sustained purposeful interest that he becomes a recognized professional and a scholar while making a success of his vocation. Such a man was Arthur M. SCOTT who, trained as an engineer and a designer of buildings, turned to microscopy and the algae purely as a hobby; then became so engrossed that he dedicated practically his entire spare time and his energy to a study of desmids. His personality, his generous financial contributions to science, and his literary achievements now make his passing felt as a keen loss to a host of friends, colleagues in phycology and engineers within the United Stades and abroad; for he earned an international reputation.

Arthur Moreland SCOTT was the only son and the tird of four children of Albert and Letitia M. SCOTT. He was born January 25, 1888 in Hornsey, a suburb of London where he attended parochial and municipal schools. His subsequent capacity for scholarly work was evidenced when he won a competetive scholarship which provided tuition at the Dame Alice OWEN's school at Islington, London. This is a privately endowed institution dating from 1613 and one that served as a preparatory school for Cambridge University. Instead of continuing on to higher education, however, Arthur withdrew from the Owen school at the insistence of his parents, and he went to work as a clerk in London offices at the age of about 16. We can imagine that this was distasteful to him for although resourceful and willing to work he nevertheless had a strong desire to achieve academically. He thus began earning his own living at an early age and because of a strong independence he answered an advertisement for a position with Captain Andrew LAWRIE, Surveyor to Lloyd's Register of Shipping at New Orleans. As a result he became employed in that city where he lived and worked from 1906.

Completing his contract with LAWRIE, he took employment with the latter's son-in-law, Mr. Ole K. OLSEN, a Danish civil engineer. At first he sold machinery and engineering supplies, among which were steel bars for reinforcing concrete. This construction medium was new and few understood its special problems. Hence SCOTT, with such experience as he had, was able to meet

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a demand for technical skill in this branch of engineering. He was a clever mathematician and early showed ability at design. He persisted in self-education and so became proficient in structural engineering as applied to building construction. Subsequently he designed many important buildings throughout Louisiana and Mississippi. In addition to his botanical writings, therefore, he leaves as permanent monuments many schools, factories, court houses and other public buildings.

During World War I, SCOTT served in an engineering corps and was discharged as a 2nd Lieutenant. It was about this time that he became a naturalized U. S. citizen, and upon returning from France he married Miss Edith KIRKWOOD of Grand Rapids, Michigan on January 5, 1920. His understanding and companionable wife now survives him.

Early in the 1930's the firm of OLE K. OLSEN Inc. was formed with SCOTT serving as Vice-President and one of four stock-holders. Besides Ole K. OLSEN, President, associated in the firm were N. H. ROSS, Secretary and R. C. GOTCH, Treasurer. This quartet remained closely united until Arthur SCOTT's retirement in 1953 and the death of Mr. GOTCH in 1954.

Because of his interest in science (physics and astronomy) as a youth he continued to study in these fields and followed developments especially in nuclear physics and radar. He learned to read German, French and Latin and knew the rudiments of Greek. He had never developed an interest in biology, but turned rather to cryptography and to woodwork for hobbies. Then in 1920 he became interested in optics, obtained a small microscope and purchased a copy of STOKE's *Aquatic Microscopy for Beginners*. Thus, like many another inquisitive student he became enthralled with the universe of microscopical organisms and was especially fascinated by desmids. He was intrigued particularly by the geometric forms of *Micrasterias* but because, as he learned later, the vicinity of New Orleans is a poor one for desmids, he found only a few, prosaic Cosmaria and Closteria. Curiously, in view of his future work, he gave up a study of these plants entirely and took to other hobbies. It was not until 1938 that he made a chance collection of algae from St Tammany Parish, north of Lake Pontchartrain that abounded in large and ornate desmids. This aroused his interest completely. He explored for literature on Louisiana desmids and he explored collecting sites ever widening his field and learning the types of habitats favorable for desmids.

He received guidance and encouragement from Dr Nelson GOWENLOCH, biologist for the Louisiana Department of Wildlife and

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Fisheries, and from American phycologists. It was his finding of the rare *Phymatodocis Nordstedtiana* Wolle which led SCOTT to write first to the late G. M. SMITH, then to W. R. TAYLOR and G. W. PRESCOTT. After making these contacts SCOTT went to work even more seriously and soon was ready to enter joint authorship of papers on desmids, first with PRESCOTT, later with GRÖNBLAD and KRIEGER.

All the while he was building a library of desmid literature, and broadening his experience by examining material from many geographical regions. He supplied his home laboratory with fine optical equipment to which he added his own improvements.

SCOTT was a perfectionist and those who worked with him appreciated his keen perception, and intellectual honesty. With his camera lucida he executed many thousands of drawings of desmids from the United States, South America, Australia, Indonesia and elsewhere. It was his hope and expressed wish that these be made available to other students of the desmids, together with his collection of several thousand vials of preserved material. His familiarity with the arts, with politics and with business economy made him an interesting and informative conversationalist.

In 1955 Arthur and Edith SCOTT made a trip to England and Europe where he visited members of his family, whom he had not seen since coming to America, and where he had conferences with Dr Einar TEILING and the late Dr Rolf GRÖNBLAD. This trip was an enriching experience as judged by his enthusiastic letters written after his return and by the increased application to his studies and writings which followed. He became interested in the genetics and the bipolarity of desmids in addition to their taxonomy and phylogeny. In the late '50's SCOTT became associated with G. W. PRESCOTT and Hannad T. CROASDALE in a project involving a synopsis of North American Desmidiaceae. To this he contributed many drawings and collections.

As long ago as 1915 Mr SCOTT joined the Louisiana Engineering Society and in 1930 he was honored (although not a college graduae) by an election as full member to the American Society of Civil Engineers. He was a member of the Lousiana Academy of Sciences, Michigan Academy of Sciences, Arts and Letters, the American Microscopical Society, and was a charter member of the Phycological Society of America, to which he gave generous support. He belonged also to A.I.B.S., I.A.P.T. and the International Phycological Society.

It is noteworthy and appropriate that his name should be perpetuated by *Amscottia mira* Grönblad and by *Staurastrum Scottii*

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Grönblad. But as memoria these names are quite unnecessary because all who knew him will remember for ever Arthur M. Scott and his contributions to botany and to engineering.

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Some observations on the morphology and cytology of Draparnaldia plumosa (Vauch.) Ag.

By Y. S. R. K. SARMA

■

INTRODUCTION

Draparnaldia Bory is a green alga belonging to the Chaetophorales. The only cytological account available of this genus is that of FERGUSON (1932) on *D. glomerata*. The present communication deals with the cytology of another species of *Draparnaldia, D. plumosa* (Vauch.) Ag., and a few observations on the morphological appearance of the alga under different cultural conditions.

MATERIAL AND METHODS

The alga under investigation was collected from Hampton Court, England, and was referred to *Draparnaldia plumosa* (cf. HAZEN, 1902; PRESCOTT, 1951). The material was fixed at the time of collection in mixtures of absolute alcohol and glacial acetic acid in proportion of 3 : 1 and 1 : 1 respectively, and was later studied cytologically employing Godward's iron-alum acetocarmine technique (GODWARD, 1948 and 50). Some material was brought in living condition to the laboratory and grown in liquid media as well as on agar in petri-dishes following standard culture methods (cf. PRINGSHEIM, 1946). Godward's medium, (GODWARD, 1942) slightly modified with soil extract, was employed both in liquid and agar cultures, which were grown under identical conditions of temperature and illumination.

KARYOLOGY

Material of *D. plumosa*, fixed at the time of collection, yielded a number of division figures which form the basis of the following account of the nuclear cytology of this species.

Nucleus.

The size of the nucleus varies considerably, depending upon the size of the cell containing it. For example, the nucleus of an axis-

Source MNHN, Paris

cell measuring 25 μ across is 6 μ in diameter, while in a cell of a short lateral, approx. 9 μ broad, the nucleus is only 2.5 μ in diameter. The nuclei of the hair cells may be sometimes even smaller.

The nucleus has a firm membrane and a well stained nucleolus, the size, of which, depends on that of the nucleus. The largest nucleolus measured 3 μ across. In the large nuclei, occasionally a few chromocentres are seen, some of which may be thick and rod-shaped (Fig. 4). The structure of the smaller nuclei is not so clear, but for the nucleolus. Possibly, they may also contain minute chromocentres. While the larger nuclei resemble those of *Ulothrix zonata* but for the chromocentres, the smaller ones look like those of *Uronema* (SARMA, 1958).

Mitosis.

The early prophase stages in the small nuclei show large numbers of granules which may be interpreted as the discontinuously stained regions of the long and slender chromosomal threads. By about the mid-prophase the granular nature disappears giving place to distinct chromosomes. The chromatids of individual chromosomes have not been observed at any stage during prophase.

From several mid and late-prophases, the chromosome number has been determined to be 14 for this species (Fig. 5 A, B and 6 A, B), and the same is also confirmed from an anaphase (Fig. 8 A, B, C).

The nuclear membrance possibly disappears even before mid-prophase, while the nucleolus is still seen at this stage (Fig. 5 B) although it is not observable after prophase.

At metaphase (Fig. 7 A, B) the chromosomes organise themselves into a plate, when their individuality could be seen only with proper differentiation. Metaphases in the large cells, which could have given a clearer picture of size relationships of various chromosomes, have not been seen. However, from the observed metaphases and anaphases, differences in respective lengths of chromosomes could be surmised. In general, one chromosome appears to be longest, two or possibly three of medium size and the rest short (Fig. 8 C). The latter are in the forme of short rods or thick dots. Even the long chromosomes do not show any median or sub-median centromeres.

Anaphases both from the large axis-cells (Fig. 8) as well as cells of short laterals (Fig. 9) present no trace of a spindle. Daughter chromosomes are orientated parallel to the long-axis of the cell and are presumed to be having sub-terminal centromeres as observed by the author in *Ulothrix zonata* (SARMA, 1958). Telophases are normal.

Source MNHN Paris

Discussion.

FERGUSON (1932) thought that the chromosomes were formed by the fusion of smaller granules appearing at early prophase. Her interpretation can be explained on the assumption of discontinuous staining of the early prophase chromosomes.

The chromosome number reported for this species is different from the number (8) reported by FERGUSON (1932) for *D. glomerata*. In both cases, however, it is not clear whether the numbers are haploid or diploid. Chromosome numbers in the allied genera of Chaetophorales viz. *Draparnaldiopsis indica* (n = 4, 2 n = 8, SINGH, 1945) and *Fritschiella tuberosa* (n = 4, 2 n = 8, SINGH, 1947) are also low when compared with the number determined here for *D. plumosa*.

FERGUSON (1932) from a metaphase of an axis-cell described some chromosomes as « distinctly constricted across the middle ». In *D. plumosa* no constricted chromosomes are observed. Their orientation and structure at anaphase do not suggest the presence of any observable centromeres.

The present observation on the absence of a spindle are in agreement with similar statements by FERGUSON (1932) in *D. glomerata*, SELBY (unpub.) in *Coleochaete* and the present author in several members of the Ulotrichales (SARMA, 1958).

MORPHOLOGICAL APPEARANCE OF THE ALGA

Draparnaldia plumosa as occurs in nature shows a distinct main axis from which laterals of limited and unlimited growth arise (Fig. 1). The cells of the main axis are often slightly barrel shaped, each of which is provided with a chloroplast having deeply incised edges and several pyrenoids. The chloroplast usually forms an equatorial girdle in the cell. Each cell of the short laterals possesses, on the other hand an entire chloroplast. The cells of the main axis are not distinguishable into nodal and internodal cells, as is the case in *Draparnaldiopsis* (BHARADWAJA, 1933).

Cultures of the alga when grown in liquid medium and on agar made up with the same solution, differed remarkably from each other and from the plant growing in the natural habitat.

The material from liquid culture showed scarcely any distinction between the main axis and the laterals (Fig. 2), the latter showing profuse branching. The alga presented a striking resemblance to a *Stigeoclonium*.

In the material on agar (Fig. 3) the growth of the main axis was apparently suppressed; the main bulk of growth, carried on

Source : MNHN, Paris

by the laterals, being diffuse, slow and not so profuse as compared with the material from the liquid culture. The branches became intermittently swollen and occasionally their cells divided in an irregular manner (Fig. 10 C) comparable to prostrate systems of certain members of other Chaetophorales. A number of rhizoidal filaments were seen to grow out from the cells, the former being occasionally surrounded by a conspicuous mucilagenous enveloppe (Fig. 10 D). Empty cells were observed rarely, indicating liberation of swarmers (Fig. 10).

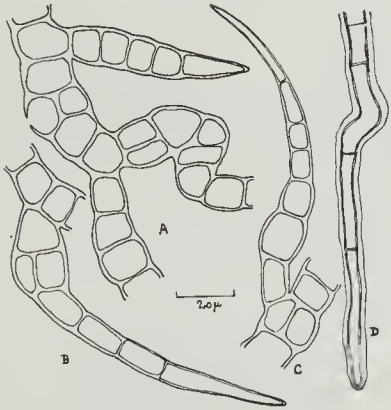

Fig. 10. A-D. — From the material growing on agar. For explanation of figures see text.

The above observations show the great plasticity of the external form of the alga in response to different conditions. Fritsch (1935, p. 254) states that « the contrast between two types of branches is, however, not always pronounced, in fact one occasionally finds specimens in which the main axis are scarcely distinguishable ».

In this connection the work of Suomalanien (1933) is of some interest. He showed that the chemical composition of the nutrient medium also influenced the extent of branching, the hair production and the general appearance of *D. glomerata* grown in cultures. He observed that in a nitrogen-rich medium, the cells of the main

Source MNHN, Paris

axis became smaller, wholly similar to those of the laterals (cf. also USPENSKAJA, 1930) and the hair growth almost stopped. On the other hand, branching and hair-building increased with increase in light intensity and CO_2 concentration.

In the present study, the factors mainly involved appear to be the physical nature of the substratum and aeration, more than the chemical factors, since the same medium has been employed in the preparation of liquid and agar cultures.

SUMMARY

The karyology of *Draparnaldia plumosa* (Vauch.) Ag. was described and the chromosome number was determind to be 14. Morphological appearance of the alga was found to be strikingly dissimilar between the materials growing in nature, in liquid medium and on agar. The probable reasons for the variation were considered.

ACKNOWLEDGMENT

My grateful thanks are due to Dr M. B. E. GODWARD, University of London, for the valuable guidance and criticism.

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Source MNHN, Paris

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(Department of Botany, Banaras Hindu University India).

EXPLANATION OF PLATE I (Pl. 9)

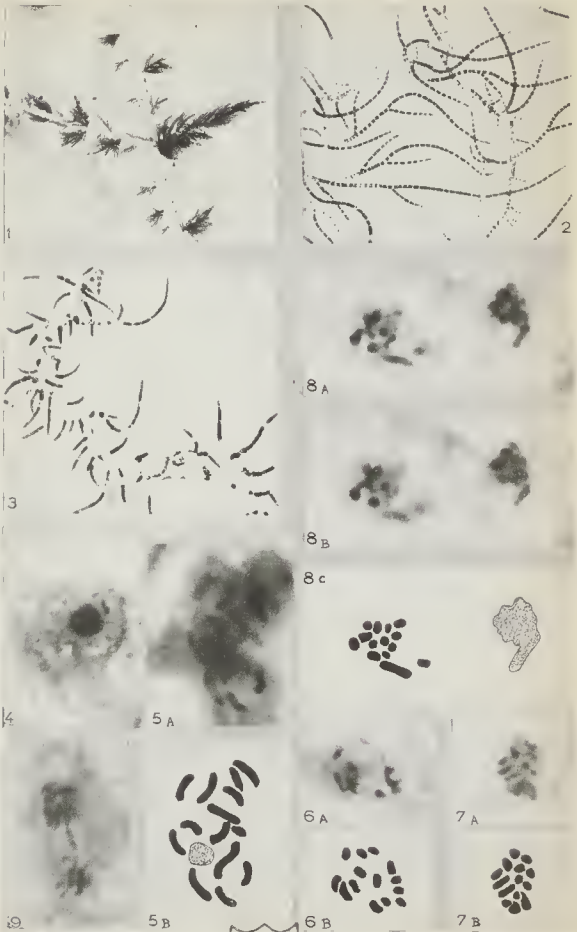
(Figs. 1 à 9).

Figs. 1-9. — *Draparnaldia plumosa.*

Fig. 1. — Material from the natural habitat. × 50.
Fig. 2. — Material growing in liquid culture. × 60.
Fig. 3. — Material growing on agar. × 50.
Fig. 4. — Resting nucleus from a cell of the main axis. « C » — Chromocentre. × 3 000.
Fig. 5 A. — Nucleus in prophase from a cell of the main axis. All chromosomes are not seen at this focal level. × 3 000.
Fig. 5 B. — Reconstructed drawing of the prophase in 5 A from all focal levels showing 14 chromosomes.
Fig. 6 A. — Late prophase from a cell of short lateral. Only a few chromosomes of the entire complement are seen at this focal level. × 3 000.
Fig. 6 B. — Reconstructed drawing of the prophase in Fig. 6 A, from all focal levels. X 3 000.
Fig. 7 A and B. — Metaphase in polar view from a cell of short lateral and its drawing respectively. Some chromosomes not fully in focus at the level in 7 A are also represented in 7 B.
Fig. 8 A-C. — Anaphase from a cell of the main axis photographed at two focal levels A and B; C : Reconstructed drawing of the anaphase from both the focal levels. From the anaphase group on the left 14 chromosomes have been counted. × 3 000.
Fig. 9. — Anaphase from a short lateral. × 3 000.

Source MNHN Paris

DRAPARNALDIA. PL. I.



BIBL. DU MUSEUM D'HIST. NATUR.

Source MNHN, Paris

The Marine Algae of Guánica, Puerto Rico

by Luis R. ALMODOVAR (1).

■

Guánica is located on the southern coast of Puerto Rico between Guayanilla and La Parguera (see Fig. 1). The area has been of botanical interest since 21 january 1886 when it was visited by the German botanist Paul Sintenis. He remained in Puerto Rico for 3 years from september 1884 to june 1887, time in which he collected a considerable number of marine algae. These specimens were given to Dr. F. Hauck for study and classification. Results of this work were published in 1888. A total of 26 species were reported for the area. They are : *Peyssonnelia rubra* (Grev.) J. Agardh, *Callithamnion* sp., *Centroceras clavulatum* Agardh, *Gracilaria confervoides* (L.) Greville, *Gracilaria multipartita* J. Agardh var. *angustissima* Harvey, *Rhabdonia tenera* J. Agardh, *Hypnea musciformis* (Wulf.) Lamouroux, *Hypnea musciformis* (Wulf.) Lamouroux f. *spinella* Hauck, *laurencia papillosa* (Forsk.) Greville, *Acanthophora thierii* Lamouroux, *Polysiphonia pectinella* Harvey, *Sargassum vulgare* Agardh, *Padina commersoni* Bory, *Ectocarpus duchassaingianus* Grunow, *Ectocarpus terminalis* Kützing, *Ulva lactuca* (L.) Le Jolis f. *genuina* Hauck, *Enteromorpha intestinalis* (L.) Link f. *prolifera* Hauck, *Enteromorpha clathrata* (Roth) J. Agardh var. *crinita* Hauck, *Chaetomorpha linum* (Fl. Dan.) Kutzing, *Penicillus capitatus* Lamarck, *Udotea flabellata* Lamouroux, *Halimeda opuntia* (L.) Lamouroux, *Halimeda tridens* (Sol.) Lamouroux, *Caulerpa clavifera* (Turn.) Agardh, *Caulerpa crassifolia* Agardh var. *mexicana* J. Agardh, and *Caulerpa plumaris* (Forsk.) Agardh.

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Source MNHN, Paris

No collecting of marine algae was done at Guánica until 1903 when Dr. M. A. HOWE, of the New York Botanical Garden, spent a week there. He has given a brief report (1903) in the Journal of the New York Botanical Garden about localities visited on this trip. A photograph of the red alga *Amphiroa tribullus,* collected at Guánica is included.

Guánica was visited again by Dr. HOWE in 1906. Although he did not publish a separate report, BRITTON (1906) stated that 231 numbers of marine algae had been collected around the island.

In 1915, Dr. HOWE returned to Puerto Rico, accompanied by Dr. Raymond C. OSBORN, of Columbia University, for the object of studing bryozoans on marine plants and collecting marine algae. Again, Guánica was visited on this trip. Through the courtesy of Mr. F. T. MAXWELL, the manager of Guánica Central at that time, they were provided with living quarters and laboratories remaining in that area for 3 weeks. A report (1915) is given in which Dr. HOWE mentioned about collecting along the shores and in shollow water in Guánica Harbor and at Ballena Bay. Dredging at several depths was accomplished also.

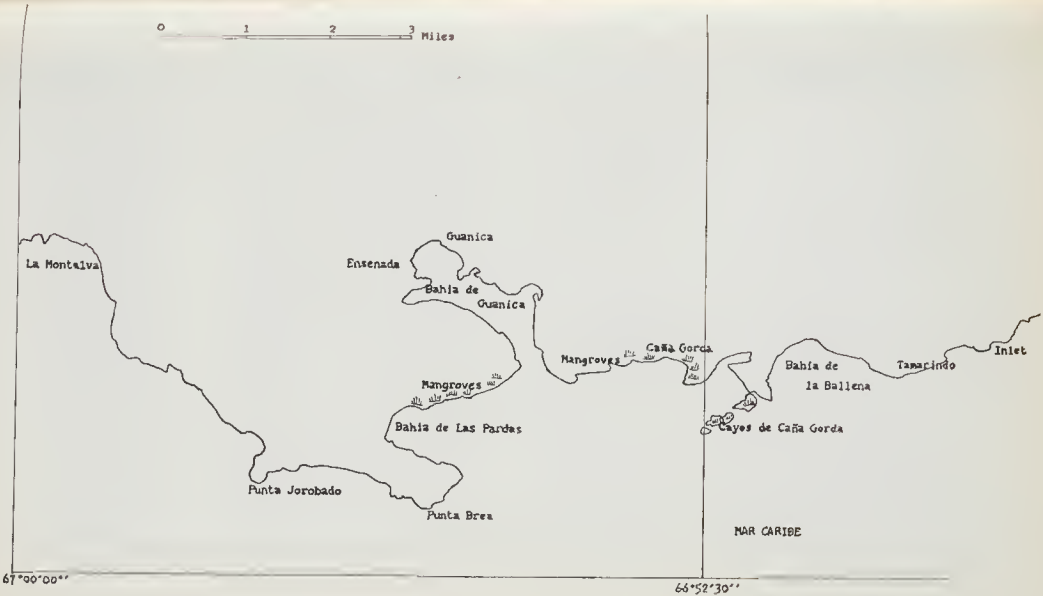
There are no published reports of collections after Dr. HOWE's trip in 1915.

Description of the Area.

The 17th of March 1958, Guánica was visited by the writer accompanied by Dr. Hugo L. BLOMQUIST, Emeritus Professor of Botany, Duke University, then, visiting professor, Institute of Marine Biology, University of Puerto Rico. Several trips to Guánica and vicinity have been made since 1961. The area comprises the shores from Salinas de Guánica to an inlet west of Ventana, Guayanilla. The stations studied are as follows : the numerous mangrove islands off Caña Gorda the shoreline at Caña Gorda, Ballena Bay Rocky Coast, and a small inlet west of Ventana.

The numerous mangrove islands provided little variety. The channels between the islands and close to the *Rhizophora* roots are about 15 feet deep. Water is murky with Secchi disk readings of less than 8 feet. The current is fast with algae attached to the uppermost section of the root near the surface of the water. A coral reef extends from Punta Jacinto due west to the end of the chain of islands. Surf is strong on the windward shore. It was found devoid of microscopic algae. Behind the reef, in front of mangroves, and extending for 300 feet at some places, there are *Porites* and *Thalassia.*

Source MNHN Paris



Source: MNHN, Paris

The shoreline at Caña Gorda is characterized by *Rhizophora* thickets. Water is shallow, with *Thalassia* growing up to the mangrove root zone.

Ballena Bay rocky coast, and a small inlet west of Ventana, provided a grat number of species. The water is clear and rough, specially near the big boulders. Collections were made down 25 feet with the help of swimming fins, snorkels, and a face mask.

No attempt has been made as to the distribution of species in relation to season, depth, and substrate. Dredging was carried out by Dr. HOWE at various depths. His collections were taken at the mouth of Guánica Harbor, east, west, and south of the Bay and in open waters. Depths ranged from shallow water near the mangroves to 40-50 meters. The area comprises several habitats such as that privided by mangrove roots to the flat rocky bottom off the mouth of Guánica Harbor.

Guánica Bay area is becoming heavily industrialized. Industrial wastes will become a hazard to the biological life of the area if proper methods of disposal are not taken. It is the hope that the Goverment of Puerto Rico takes measures in order to protect such an interesting area.

Results.

Guánica and vicinity provided a total of 108 species. These are represented as follows : *Chlorophyta,* 17 families, 11 genera, 22 species; *Phaeophyta,* 4 families, 9 genera, 15 species; *Rhodophyta,* 16 families, 42 genera, 71 species. These include all those collected by the writer and a great number by Dr. Marshall. A. HOWE. The HOWE specimens have not been reported before in the literature. This Collection was made available through the courtesy of The New York Botanical Garden. Some of the material included in the summer of 1958 when the writer had the privilege to visit the Garden, the rest has been studied at the laboratory, Institute of Marine Biology, La Parguera, Puerto Rico.

Twenty species are reported for the first time for Puerto Rico, so far as known.

Catalogue of Species.

Abbreviations used to designate the location of specimens conform to those proposed in the Index Herbariorum, Part 1, Ed. 4 (1959). Exceptions (not found in the Index) are indicated by an asterik. They are Follows : AL, Dept. of Botany, University of Adelaide, *COL, Lamont Geological Observatory of Columbia Uni-

Source MNHN, Paris

versity, *D, Herbarium of Francis DROUET, DUKE, Herbarium of Duke University, *HP, Herbarium, Instituto de Investigationes Pesqueras, España, *IMB, Algal Herbarium, Institute of Marine Biology, University of Puerto Rico, *IU, Herbarium of Isamu UMEZAKI, L — Rijksherbarium, Leiden, NY — Herbarium, New York Botanical Garden, UC — Herbarium, University of California and US — U.S. National Museum

Names with an asterisk indicate that is the first published record, so far as know, from Puerto Rico.

CHLOROPHYTA

ULVACEAE

Ulva fasciata Delile

Attached to rocks and shells, in shallow water, near El Faro, H. L. BLOMQUIST & L. R. ALMODOVAR *3138*, 17 Mar. 1958 (IMB).

Ulva lactuca L. var. *rigida* (C. Ag.) Le Jolis

On rocks, in about 6 ft. of water, west of Guánica Bay, H. L. BLOMQUIST *13022*, 31 Mar. 1942 (DUKE, IMB); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4341*, 4 Nov. 1961 (DUKE, IMB, L, NY).

CLADOPHORACEAE

Cladophora fascicularis (Mert.) Kützing

On rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4327*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

DASYCLADACEAE

Acetabularia crenulata Lamouroux

On shells, in mud, shallow water, near El Faro, between Guánica Bay and Caña Gorda, H. L. BLOMQUIST & L. R. ALMODOVAR *3135*, 17 Mar. 1958 (AD, D, DUKE, HP, IMB, IU, NY).

VALONIACEAE

Chamaedoris peniculum (E. & S.) Kuntze

On rocks in about 15 feet of water, L. R. ALMODOVAR & V. M. ROSADO *4454*, 28 Mar. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

**Siphonocladus tropicus* (Crouan) J. Agardh

On rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4442*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Source MNHN Paris

BRYOPSIDACEAE

Bryopsis pennata Lamouroux

On rocks, behind a reef, in 5-10 feet of water, Baltena Bay, L. R. ALMODOVAR & V. M. ROSADO *4433*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, R. L. ALMADOVAR & V. M. ROSADO *4446*, 16 Feb. 1962 (IMB).

CAULERPACEAE

Caulerpa cupressoides (West) Agardh

Guánica : On reefs and cays, common in 2-6 dm. of water *Rhizophora* association, M. A. HOWE *7261*, 30 June 1915 (IMB, NY).

**Caulerpa lanuginosa* J. Agardh

On rocks, small inlet, west of Ventana, between Ventana and Tamarindo, L. R. ALMODOVAR & V. M. ROVADO *4427*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Caulerpa microphysa (Weber van Bosse) Feldmann

Dredged in 7 meters of water off the mouth of Guánica Harbor, M. A. HOWE *7391*, 4 July 1915 (IMB, NY).

Caulerpa prolifera (Forsk.) Lamouroux f. *obovata* J. Agardh

On rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4354*, 6-8 Dec. 1961 (DUKE, IMB, L, NY).

Caulerpa prolifera (Forsk.) Lamouroux f. *zosterifolia* Börgesen

In mud, near El Faro, L. R. ALMODOVAR *3140*, 17 Mar. 1958 (DUKE, IMB, IU, NY); on rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4355*, 6-8 Dec. 1961 (DUKE, IMB, NY).

Caulerpa racemosa (Forsk.) J. Agardh

On rocks, small inlet, west of Ventana, between Ventana and Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4420*, 16 Feb. 1962 (D, DUKE, IMB, L, NY). L. R. ALMODOVAR & V. M. ROSADO *4434*, 16 Feb. 1962 (DUKE, IMB, L, NY).

Caulerpa sertularioides (Gmel.) Howe

In mud, shallow water near El Faro, H. L. BLOMQUIST & L. R. ALMODOVAR *3143*, 17 Mar. 1958 (DUKE, IMB, IU, NY).

Caulerpa taxifolia (Vahl) C. Agardh

On rocks, near mangrove roots, Km. 5 H. 1, road to Caña Gorda, L. R. ALMODOVAR & V. M. ROSADO *3920*, 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

Source MNHN Paris

CODIACEAE

Codium isthmocladum Vickers

On rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. Almodovar & V. M. Rosado *4331*, 4 Nov. 1961 (IMB).

Halimeda discoidea Decaisne

On rocks, behind a reef, in 5-10 feet of water, Bellena Bay, L. R. Almodovar & V. M. Rosado *4326*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY, UC); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4348*, 6-8 Dec. 1961 (DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4429*, 16 Feb. 1962 (DUKE, IMB, L, NY).

Halimeda monile (Ellis and Solander) Lamouroux

On rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. Almodovar & V. M. Rosado *4342*, 4 Nov. 1961 (DUKE, IMB, L, NY); on rocks, in about 15 feet of water, L. R. Almodovar & V. M. Rosado *4452*, 28 Mar. 1962 (DUKE, IMB, L, NY).

Penicillus capitatus Lamarck

In mud, shallow water, among mangrove roots, near Caña Gorda, H. L. Blomquist & L. R. Almodovar *3154*, *3155*, 17 Mar. 1958 (IMB).

Penicillus lamourouxii Decaisne

On rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4428*, 16 Feb. 1962 (IMB).

Udotea conglutinata (Ell. & Sol.) Lamouroux

On sand, among mangrove roots, near El Faro, H. L. Blomquist & L. R. Almodovar *3148*, 17 Mar. 1958 (IMB).

Udotea flabellum (Ell. & Sol.) Lamouroux

On sand, among mangrove roots, near El Faro, H. L. Blomquist & L. R. Almodovar *3147*, 17 Mar. 1958 (IMB); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4363*, 6-8 Dec. 1961 (IMB).

Pheophyta

ECTOCARPACEAE

Ectocarpus brevariculatus J. Agardh

On mangrove roots, Islands off San Jacinto, Caña Gorda, L. R. Almodovar & V. M. Rosado *3924*, 7 Feb. 1961 (COL, D,

Source MNHN Paris

DUKE, IMB, L, NY, UC, US); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4338*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY, UC).

DICTYOTACEAE

Dictyota dichotoma (Huds.) Lamouroux

On rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4332*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4360*, 6-8 Dec. 1961 (IMB, NY).

Dictyota divaricata Lamouroux

On rocks, sandy beach, Tamarindo, Caña Gorda, L. R. ALMODOVAR L. R. ALMODOVAR & V. M. ROSADO *4332*, 4 Nov. 1961 (Col, L, DUKE, & V. M. ROSADO *3951*, 16 Feb. 1961 (DUKE, IMB, L, NY).

Dictyota indica Sonder

On rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4426*, 16 Feb. 1962 (IMB).

Spatoglosum schroederi (Mert.) Kützing

Washed ashore on sandy beach, near Tamarindo, Caña Gorda, L. R. ALMODSVAR & V. M. ROSADO *3930*, 15 Feb. 1961 (COL, DUKE, IMB, L, NY); on rocks, in sand, in strong wave action, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *3947*, 16 Feb. 1961 (IMB); on rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4351*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4431*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Dictyopteris delicatula Lamouroux

On rocks, in sand, in strong wave action, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *3950*, 16 Feb. 1961 (IMB); on rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4438*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Dictyopteris justii Lamouroux

On rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4347*, 6-8 Dec. 1961 (DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4432*, 16 Feb. 1962 (DUKE, IMB, L, NY).

Pocokiella variegata (Lamx.) Papenfuss

On rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4436*, 16 Feb. 1962 (IMB).

Source: MNHN, Paris

Stypopodium zonale (Lamx.) Papenfuss

On rocks, in about 15 feet of water, L. R. Almodovar & V. M. Rosado *4456*, 28 Mar. 1962 (D, DUKE, IMB, L, NY).

Padina gymnospora (Kütz.) Vickers

Attached on rocks, shallow water, near El Faro, H. L. Blomquist & L. R. Almodovar *3139*, 17 Mar. 1958 (IMB); on rocks, in strong wave action, Tamarindo, L. R. Almodovar & V. M. Rosado *3945*, 16 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4361*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY, UC).

Padina vickersiae Hoyt

On rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4449*, 16 Feb. 1962 (COL, D, DUKE, IMR, L, NY).

PUNCTARIACEAE

**Rosenvingea intricata* (J. Ag.) Börgesen

Washed ashore in abundance, Guánica Harbor, M. A. Howe *2587*, 26 June 1903 (IMB, NY).

SARGASSACEAE

Sargassum lendigerum (L.) Kützing

On rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4441*, 16 Feb. 1962 (IMB).

Sargassum platycarpum Montagne

On rocks, in sand, in strong wave action, Tamarindo, L. R. Almodovar & V. M. Rosado *3949*, 16 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

Sargassum polyceratium Montagne

Washed ashore, L. R. Almodovar & V. M. Rosado *3939*, 15 Feb. 1961 (IMB); on rocks, in sand, strong wave action, Tamarindo, L. R. Almodovar & V. M. Rosado *3948*, 16 Feb. 1961 (IMB).

Rhodophyta

BANGIACEAE

**Erythrotrichia carnea* (Dillw.) J. Agardh

On *Acanthophora spicifera*, on reef, east of mouth of Guánica Harbor, M. A. Howe *7308*, 1 July 1915 (IMB, NY).

Source MNHN, Paris

HELMINTHOCLADIACEAE

Liagora mucosa M. A. Howe

On rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4425*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

CHAETANGIACEAE

Galaxaura cylindrica (Ell. & Sol.) Lamouroux

On rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4336*, 4 Nov. 1961 (D, DUKE, IMB, L, NY).

Galaxaura marginata (E. & S.) Lamouroux

Washed ashore, near Tamarindo, Caña Gorda, L. R. ALMODOVAR & V. M. ROSADO *3926*, *3938*, 15 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4335*, *4338*, 4 Nov. 1961 (IMB); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4339*, 4 Nov. 1961 (COL, D, DUKE, IMB, L NY, UC); on rocks, Tamarindo, L. R. ALMADOVAR & V. M. ROSADO *4362*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY).

Galaxaura oblongata (E. & S.) Lamouroux

On rocks, near mangrove roots, Km 5 H 1, road to Caña Gorda, L. R. ALMODOVAR & V. M. ROSADO *3919*, 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

BONNEMAISONIACEAE

**Asparagopsis taxiformis* (Delile) Collins & Hervey

Dredged in 7 m of water, off the mouth of Guánica Harbor, M. A. HOWE *7395*, 4 July 1915, (IMB, NY); dredged in 15 m. of water, off the mouth of Guánica Harbor, M. A. HOWE *7430*, 4 July 1915 (IMB, NY); on rocks, in about 15 feet of water, L. R. ALMODOVAR & V. M. ROSADO *4455*, 28 Mar. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

GELIDIACEAE

Gelidiella acerosa (Forsk.) Feldmann & Hamel

Collected at mouth of Guánica Harbor, M. A. HOWE *6983*, 21 June 1915 (IMB, NY); dredged in 12 meters of water east of the mouth of Guánica Harbor, M. A. HOWE *7063*, 23 June 1915 (NY); in 2-6 dm. of water on reef, east of mouth of Guánica

Source MNHN Pa

Harbor, M. A. Howe *7306*, 1 July 1915 (IMB, NY); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4349*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY, UC); on rocks, small inlet, west of Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4433*, 16 Feb. 1962 (DUKE, IMB, NY).

Gelidium corneum (Huds.) Lamouroux

On rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4364*, 6-8 Dec. 1961 (IMB, NY); on rocks, small inlet, west of Ventana, and Tamarindo, L. R. Almodovar & V. M. Rosado *4423*, 16 Feb. 1962 (DUKE, IMB, L, NY).

CORALLINACEAE

Melobesia membranacea (Esper) Lamouroux

On *D. dentata*, dredged in 9-12 meters of water, east of the mouth of Guánica Harbor, M. A. Howe *7069*, 23 June (IMB, NY); on *Thalassia*, dredged in 6-8 meters of water, Pardas Bay, M. A. Howe *7243*, 29 June 1915 (IMB, NY); on *Caulerpa crassifolia*, east of the mouth off Guánica Harbor, M. A. Howe *7443*, 4 July 1915 (NY).

Amphiroa fragilissima (L.) Lamouroux

Islas off San Jacinto, Caña Gorda, on mangrove roots, L. R. Almodovar & V. M. Rosado *3925*, 7 Feb. 1961 (LUKE, IMB, L, NY).

Amphiroa rigida Lamouroux var. *antillana* Börgesen

Dredged off Bahia Salinas, west of Punta Brea, in 15-20 meters of waters, L. R. Amodovar, J. Rivera, P. & F. Rosado *3863*, 28 Sept. 1959 (IMB).

**Corallina cubensis* (Mont.) Kutzing

Washed ashore in great quantities, Ballena Bay, M. A. Howe *6921*, 20 June 1915, (IMB, NY); dredged in 7-10 meters of water, at mouth of Guánica Harbor, M. A. Howe *7009*, 22 June 1915 (IMB, NY); dredged in 10 m of water, off the mouth of Guánica Harbor, M. A. Howe *7231*, 29 June 1915 (IMB, NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7427*, 4 July 1915 (IMB, NY); on *Vidalia*, dredged in 14 meters, off the mouth of Guánica Harbor, M. A. Howe *7639*, 10 July 1915 (NY).

Source MNHN, Paris

Corallina subulata Ellis & Solander

Dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7428*, 4 July 1915 (IMB, NY); dredged in 13 meters of water, off Pt. Brea, Guánica Harbor, M. A. Howe *7619*, 10 July 1915 (IMB, NY); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. Almodovar & V. M. Rosado *4334*, 4 November 1961 (IMB).

GRATELOUPIACEAE

Halimenia floresia (Clem.) Ag.

Dredged in 6 m. of water, Pardas Bay, near Guánica Harbor, M. A. Howe *7240*, 29 June 1915 (IMB, NY); dredged in 6 m. of water, off mouth Guánica Harbor, M. A. Howe *7355*, 2 July 1915 (NY); dredged in 7 m. of water, off mouth Guánica Harbor, M. A. Howe *7400*, 4 July 1915 (NY); dredged in 13 m. of water, off Pt. Brea, near Guánica Harbor, M. A. Howe *7623*, 10 July 1915 (NY).

Grateloupia filicina (Wulf.) C. Agardh

One stones at 1 t. m., M. A. Howe *2593*, 26 june 1903 (IMB, NY); on stones,, n. 1 t. m., M. A. Howe *6920*, 19 June 1915 (IMB, NY).

Cryptonemia crenulata J. Agardh

On old gorgonian, dredged in 10 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7234*, 29 June 1915 (IMB, NY).

GRACILARIACEAE

Gracilaria crassissima (Crouan) J. Agardh

In 2 dm. of water, in surge, mouth of Guánica Harbor, M. A. Howe *7375*, 4 July 1915 (IMB, NY).

**Gracilaria curtissiae* J. Agardh

On rocks, n. l. t. m., M. A. Howe *2650*, 28 June 1903 (NY); floating, M. A. Howe *6970*, 21 Junes 1915 (IMB, NY); dredged in 7-10 meters of water at mouth of Guánica Harbor, M. A. Howe *7007*, 22 June 1915 (NY).

Gracilaria damaecornis J. Agardh

On rocks in shallow water, east side of Guánica Bay, H. L. Blomquist *12406*, 7 Jan. 1942 (DUKE, IMB); on rocks, near mangrove roots, Km. 5 H. 1, road to Caña Gorda, L. R. Almadovar & V. M. Rosado *3921*, 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4422*, 16 Feb. 1962 (D, DUKE, IMB, L, NY).

Source MNHN Paris

Gracilaria debilis (Forsk.) Börgesen

Dredged in 15 meters of water off the mouth of Guánica Harbor, M. A. Howe *7448*, 10 July 1915 (IMB, NY); Washed ashore, on sandy beach near Tamarindo, Caña Gorda, L. R. Almodovar & V. M. Rosado *3929*, 15 Feb. 1961 (DUKE, IMB, NY); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4352*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L NY).

**Gracilaria domingensis* Sonder

On rocks, t.t.m., Lemon Bay, M. A. Howe *2631*, 27 June 1903 (IMB, NY); l. t. m., M. A. Howe *6918*, 19 June 1915 (IMB, NY); on rocks, 3-6 dm., M. A. Howe *6976*, 21 June 1915 (IMB, NY); washed ashore, Caña Gorda, L. R. Almodovar & V. M. Rosado *3927*, 15 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks strong wave action Tamarindo,, L. R. Almodovar & V. M. Rosado *3942*, 16 Feb. 1961 (DUKE, IMB, L, NY); on rocks, small inlet, west of Ventena, L. R. Almodovar & V. M. Rosado *4443*, 16 Feb. 1962 (IMB).

Gracilaria ferox J. Agardh

On rocks, n.l.t.m., reef east of mouth of Guánica Harbor, M. A. Howe *7330*, 1 July 1915 (IMB, NY); dredged in 7 m. of water, at mouth of Guánica Harbor, M. A. Howe *7413*, 22 June 1915 (NY).

Gracilaria foliifera (Forsk.) Rörgesen

On rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4358*, 6-8 Dec. 1961 (DUKE, IMB, L, NY).

Gracilaria mammillaris (Mont.) M. A. Howe

On rocks, n.l.t.m., M. A. Howe *2645*, 28 June 1903 (NY); dredged in 7-10 meters of water, at mouth of Guánica Harbor, M. A. Howe *7011*, 22 June 1915 (NY); on rocks, shallow water, near El Faro, H. L. Blomquist & L. R. Almodovar *3141*, 17 Mar. 1958 (AD, D, DUKE, IIP, IMB, IU, NY); on rocks, shallow water, near El Faro, H. L. Blomquist & L. R. Almodovar *3151*, 17 Mar. 1958 (DUKE, IMB, IU, NY); washed ashore, on sandy beach, near Tamarindo, Cána Gorda, L. R. Almodovar & V. M. Rosado *3928*, 15 Feb. 1961 (DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4424*, 16 Feb. 1962 (IMB).

Gracilaria sjoestedtii Kylin

Washed ashore, M. A. Howe *2586*, 25 June 1903 (IMB, NY); on stones, M. A. Howe *6923*, 19 June 1915 (IMB, NY); on rocks, shal-

Source MNHN, Paris

low water, near El Faro, between Caña Gorda & Guanica Bay, H. L. BLOMQUIST & L. R. ALMODOVAR *3742*, 17 Mar. 1958 (IMB).

Gracilaria verrucosa (Huds.) Papenfuss

Prope Guánica ad Playa, *P. Sintenis* 77, 23 I 1886 (L.); dredged in 6 meters of water, Pardas Bay, M. A. HOWE *7241*, 29 June 1915 (NY); dredged off Bahia Salinas, west of Punta Brea, in 15-20 meters of water, L. R. ALMODOVAR, J. RIVERA, P. & F. ROSADO *3864*, 28 sept. 1959 (IMB); on rocks, sandy beach, Tamarindo, Caña Gorda, L. R. ALMODOVAR & V. M. ROSADO *3940*, 16 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

SOLIERIACEAE

Agardhiella ramosissima (Harvey) Kylin

On rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4359*, 6-8 Dec. 1961 (IMB).

Agardhiella tenera (Ag.) Schmitz

Dredged in 7-10 meters of water, at mouth of Guánica Harbor, M. A. HOWE *7019*, 22 June 1915 (NY).

**Eucheuma acanthocladum* (Harv.) J. Agardh

Dredged in 15 meters of water, off Guánica Harbor, M. A. HOWE *7447*, 4 July 1915 (IMB, NY).

Eucheuma echinocarpum Areschoug

Dredged in 40-50 meters of water, east of the mouth of Guánica Harbor, M. A. HOWE *7097*, 23 June 1915 (IMB, NY); dredged in 14 meters of water, off mouth of Guánica Larbor, M. A. HOWE *7641*, 10 July 1915 (NY); washed ashore, Caña Gorda, L. R. ALMODOVAR & V. M. ROSADO *3935*, 15 Feb. 1961 (DUKE, IMB, NY); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. ALMODOVAR & V. M. ROSADO *4329*, 4 Nov. 1961 (D, DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4421*, 16 Feb. 1962 (L, DUKE, IMB, L, NY).

HYPNEACEAE

**Hypnea cornuta* (Lamour.) J. Agardh

In 2 dm. of water, in shallow places behind a reef, Ballena Bay, M. A. HOWE *6949*, 20 June 1915 (IMB, NY).

Hypnea musciformis (Wulf.) Lamouroux

Very common on rocks a various algae, in 1-2 feet w.l.t. mouth of Guánica Harbor, M. A. HOWE *2649*, 28 June 1903 (NY); on

Source MNHN Paris

rocks in 3 dm. of water, mouth of Guánica Harbor, M. A. Howe *6975,* 21 June 1915 (IMB, NY); dredged in 7 meters of water off the mouth of Guánica Harbor, M. A. Howe *7419,* 4 July 1915 (NY); on rocks, near mangrove roots, Km. 5 H. 1, road to Caña Gorda, L. R. Almodovar & V. M. Rosado *3916,* 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, in sand, etc., strong wave action, Tamarindo, L. R. Almodovar & V. M. Rosado *3943,* 16 Feb. 1961 (DUKE, IMB, L, NY); on rocks, small inlet, west of Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4440,* 16 Feb. 1962 (DUKE, IMB, NY).

Hypnea spinella (C. Ag.) Kützing

On rocks, shallow water near El Faro, H. L. Blomquist & L. R. Almodovar *3153,* 17 Mar. 1958 (AD, D, DUKE, HP, IMB, IU, NY).

RHODYMENIACEAE

**Chrysymenia enteromorpha* Harvey

Dredged in 8 m. of water off the mouth of Guánica Harbor, M. A. Howe *7591,* 10 July 1915 (NY).

**Coelarthrum albertisii* (Piccone) Börgesen

On bases of *D. dentata,* etc., dredged in 9-12 meters of water, east of the mouth of Guánica Harbor, M. A. Howe *7077,* 23 June 1915 (IMB, NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7401,* 4 July 1915 (IMB, NY); dredged, in 15 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7432,* 4 July 1915 (NY); dredged in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7603,* 10 July 1915 (NY).

CHAMPIACEAE

Coelothrix irregularis (Harv.) Börgesen

On rocks, at l.t.m., Salinas Bay, M. A. Howe *2681,* 29 June 1903 (IMB, NY).

Champia parvula (Ag.) Harvey

Dredged in 7-10 meters of water, at mouth of Guánica Harbor, M. A. Howe *7013,* 22 June 1915 (NY); with algae in shallow water on reef, east of mouth of Guánica Harbor, M. A. Howe *7309,* 1 July 1915 (IMB, NY); dredged in 15 meters of water off the mouth of Guánica Harbor, M. A. Howe *7431,* 4 July 1915 (NY);

Source MNHN, Paris

dredged in 8 m. of water, off the mouth of Guánica Harbor, M. A. Howe *7593*, 8 July 1915 (NY); dredged in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7402*, 10 July 1915 (NY); dredged, in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7406*, 10 July 1915 (IMB, NY); on rocks, in about 15 feet of water, L. R. Almodovar & V. M. Rosado *4453*, 28 Mar. 1962 (IMB, NY).

Champia salicornioides Harvey

Dredged, in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7604*, 10 July 1915 (NY).

CERAMIACEAE

Crouania attenuata (Bonnem.) J. Agardh

On *Corallina*, etc., n.l.t.m., east of the mouth of Guánica Harbor, M. A. Howe *7318*, 1 July 1915 (IMB, NY); dredged in 12 meters,, collected east of the mouth of Guánica Harbor, M. A. Howe *7348*, 1 July 1915 (NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7415*, 4 July 1915 (NY).

Wrangelia argus Montagne

On coral rocks, n.l.t.m., Salinas Bay, M. A. Howe *2673*, 29 June 1903 (IMB, NY); on rocks, small inlet, west of Ventana, between Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4448*, 16 Feb. 1962 (IMB, NY).

Wrangelia bicuspidata Börgesen

Dredged in 7-10 meters of water at mouth of Guánica Harbor, M. A. Howe *7014*, 22 June 1915 (NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7397*, 4 July 1915 (IMB, NY); dredged in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7606*, 10 July 1915 (NY).

Wrangelia penicellata C. Agardh

Dredged in 7 meters of water, off Guánica Harbor, M. A. Howe *7403*, 4 July 1915 (IMB, NY); dredged in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7605*, 10 July 1915 (NY).

**Callithamnion byssoides* Arnott in Hooker

Floating at Ballena Bay near Guánica, M. A. Howe *6932*, 20 June 1915 (NY).

Source MNHN, P

**Callithamnion herveyi* M. A. Howe

On rocks, small inlet, west of Ventana, L. R. ALMODOVAR & V. M. ROSADO *4445*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY; UC, US).

**Griffithsia globulifera* Harvey

Dredged in 15 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7433*, 15 July 1915 (NY).

**Spermothamnion gorgoneum* (Mont.) Bornet

On *Codium*, dredged in 6 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7366*, 2 July 1915 (NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7405*, 4 July 1915 (NY).

Ceramium byssoideum Harvey

On *Spyridia*, floating, Ballena Bay, M. A. HOWE *6939*, 20 June 1915 (NY); on roots of *Rhizophora*, n.l.t.m., west of mouth of Guánica Harbor, M. A. HOWE *7275*, 30 June 1915 (IMB, NY); on *Laurencia*, n.l.t.m., mouth of Guánica Larbor, M. A. HOWE *7314*, 1 July 1915 (IMB, NY); washed ashore, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *3931*, 15 Feb. 1961 (IMB).

**Ceramium fastigiatum* (Roth) Harvey

Detached, M. A. HOWE *2672*, 29 June 1903 (IMB, NY).

Ceramium nitens (Ag.) J. Agardh

Dredged, off Bahia Salinas, west of Punta Brea, in 15-20 meters of water, L. R. ALMODOVAR, J. RIVERA, P. & F. ROSADO *3858*, *3860*, 28 Sept. 1959 (IMB).

Centroceras clavulatum (C. Ag.) Montagne

Washed ashore, M. A. HOWE *2600*, 26 June 1903 (NY); on stones, n.l.t.m., M. A. HOWE *2651*, 28 June 1903 (IMB, NY); on a stick, n.l.t.m., Ballena Bay, M. A. HOWE *6942*, 20 June 1915 (IMB, NY); dredged in 7 meters of water, at the mouth of Guánica Harbor, M. A. HOWE *7017*, 22 June 1915 (NY): on roots of *Rhizophora*, n.l.t.m., Guánica Harbor, M. A. HOWE *7038*, 23 June 1915 (IMB, NY) in shallow water, Playa de Guánica, M. A. HOWE *7230*, 29 June 1915 (IMB, NY); in *Thalassia*, shallow water, in *Rhizophora* association, Guánica Harbor, M. A. HOWE *7045*, 4 July 1915 (NY); on reef, n.l.t.m., east of the mouth of Guánica Harbor, M. A. HOWE *7335*, 1 July 1915 (IMB, NY); dredged off Bahia Salinas, west of Punta Brea,

Source MNHN Paris

in over 20 meters of water, épiphytic on other algae, L. R. ALMODOVAR, J. RIVERA, P. & F. ROSANO *3871*, 28 Sept. 1959 (IMB).

Spyridia aculeata (Schrimp.) Kützing

Floating, Ballena Bay, near Guánica, M. A. HOWE *6937*, 20 June 1915 (IMB, NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7420*, 4 July 1915 (NY); dredged in 15 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7438*, 4 July 1915 (NY); on rocks, shallow water, near mangroves, near El Faro, between Caña Gorda and Guánica Bay, H. L. BLOMQUIST & L. R. ALMODOVAR *3136*, 17 Mar. 1958 (AD, DUKE, HP, IMB, IU, NY); on rocks, in sand, etc., strong wave action, Tamarindo L. R. ALMODOVAR & V. M. ROSADO *3944*, 16 Feb. 1961 (IMB); on rocks, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *4346*, 6-8 Dec. 1961 (DUKE, IMB, L, NY).

**Spyridia clavala* Kützing

Floating, Ballena Bay, M. A. HOWE *6938*, 20 June 1915 (IMR, NY).

Spyridia filamentosa (Wulf.) Harvey

Washed ashore, M. A. HOWE *2597*, 26 June 1903 (NY); on roots of mangroves, near l.t.m., Lemon Bay, M. A. HOWE *2607*, 27 June 1903 (NY); dredged in 7-10 meters of water at mouth of Guánica Harbor, M. A. HOWE *7015*, *7016*, 22 June 1915 (NY); common in 1-6 dm. of water, shallow water, in *Rhizophora* association, Guánica Harbor, M. A. HOWE *7036*, 23 June 1915 (NY); in 9 meters of water, Salinas Cove, near Guánica Harbor, M. A. HOWE 7224, 27 June 1915 (NY); dredged in 8 meters of water, Pardas Bay, near Guánica Harbor, M. A. HOWE *7245*, 29 June 1915 (NY); very common in shallow water, in *Rhizophora-Thalassia* association, west of mouth Guánica Harbor, M. A. HOWE *7267*, 30 June 1915 (NY); washed ashore, Tamarindo, L. R. ALMODOVAR & V. M. ROSADO *3934*, 15 Feb. 1961 (IMB).

DELESSERIACEAE

**Hypoglossum tenuifolium* (Harvey) J. Agardh

In 30 meters of water, Guánica Harbor, M. A. HOWE *7351*, 1 July 1915 (NY).

Martensia pavonia (Ag.) J. Agardh

Dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7398*, 4 July 1915 (NY); dredged in 8 meters of water, off the mouth of Guánica Harbor, M. A. HOWE *7592*, 8 July 1915

Source: MNHN, Paris

(NY); dredged in 9 meters of water, of the mouth of Guánica Harbor, M. A. Howe *7601*, 10 July 1915 (NY).

DASYACEAE

Dasya mollis Harvey

On roots of *Rhizophora* Lemon Bay, M. A. Howe *2613*, 27 June 1903 (IMB, NY).

Heterosiphonoa wurdemanni (Bail.) Falkenberg

On rocks, small inlet, west of Ventana, between Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4447*, 16 Sept. 1962 (IMB, NY).

Dictyurus occidentalis J. Agardh

Dredged in 14 maters of water, off the mouth of Guánica Harbor, M. A. Howe *7637*, 10 July 1915 (IMB, NY); on rocks, in ahout 15 feet of water, L. R. Almodovar & V. M. Rosado *4457*, 28 Mar. 1962 (D, DUKE, IMB, L, NY, UC).

RHODOMELACEAE

Polysiphonia howei Hollemberg

Dredged in 40-50 meters of water, east of the mouth of Guánica Harbor, M. A. Howe *7085*, 23 June 1915 (IMB).

Bryothamnion seaforthii (Turn.) Kützing

Washed ashore, mouth of Guánica Harbor, M. A. Howe *7372*, 4 July 1915 (IMB, NY); on rocks, shallow water, protected cove, near El Faro, H. L. Blomquist & L. R. Almodovar *3137*, 17 Mar. 1958 (ADU, D, DUKE, HP, IMB, IU, NY); on rocks, near mangrove roots, Km. 5 H. 1, road to Caña Gorda, L. R. Almodovar & V. M. Rosado *3915*, 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, behind a reef, in 5-10 feet of water, Ballena Bay, L. R. Almodovar & V. M. Rosado *4343*, 4 Nov. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

Bryothamnion triquetrum (Gmel.) Howe

On rocks, near l.t.m., Lemon Bay, M. A. Howe *2603*, 27 June 1903 (IMB, NY); on rocks, in 3-6 dm., mouth of Guánica Harbor, M. A. Howe *6967*, 21 June 1915 (IMB, NY); dredged in 9-12 meters, east of the mouth of Guánica Harbor, M. A. Howe *7079*, 23 June 1915 (IMB, NY); unattached and vegetating among *Rhizophora*, n.l.t.m., east of the mouth of Guánica Harbor, M. A. Howe *7270*, 1 July 1915 (IMB, NY); dredged in 7 meters of water,

Source MNHN, Paris

off the mouth of Guánica Harbor, M. A. Howe 7426, 4 July 1915, (NY); attached to rocks, shallow water near El Faro H. L. Blomquist & L. R. Almodovar *3114*, 17 Mar. 1958 (DUKE, IMB, NY); on rocks, near mangrove roots, Km. 5 H. 1, road to Caña Gorda, L. R. Almodovar & V. M. Rosado *3914*, 7 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, small inlet west of Ventana, L. R. Almodovar & V. M. Rosado *4439*, 16 Feb. 1962 (DUKE, IMB, NY).

Digenea simplex (Wulf.) C. Agardh

Floating, Ballena Bay near Guánica, M. A. Howe *6960*, 20 June 1915 (NY).

Lophocladia trichoclados (Mert.) Schmitz

Dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7396*, 4 July 1915 (IMB, NY); dredged in 15 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7429*, 4 July 1915 (IMB, NY); dredged in 8 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7591*, 8 July 1915 (NY); dredged in 9 meters of water, of the mouth of Guánica Harbor, M. A. Howe *7609*, 10 July 1915 (IMB, NY).

Murrayella periclados (Ag.) Schmitz

On rocks, low littoral, M. A. Howe *2625*, 27 June 1903 (IMB, NY); on roots of *Rhizophora*, n.l.t.m., shallow water in *Rhizophora* association, Guánica Harbor, M. A. Howe *7049*, 23 June 1915 (IMB, NY); on roots of *Rhizophora*, between tide marks, Salinas Cove, near Guánica Harbor, M. A. Howe *7210*, 27 June 1915 (NY); on roots of *Rhizophora*, just above l.t.m., west of the mouth of Guánica Harbor, M. A. Howe *7276*, 30 June 1915 (NY); in shallow water, in *Rhizophora* association, east of Guánica Harbor, M. A. Howe *7235*, 1 July 1915 (NY).

Bostrychia tenella (Vahl) J. Agardh

On roots of *Rhizophora*, n.l.t.m., east of the mouth of Guánica Harbor, M. A. Howe *7307*, 1 July 1915 (IMB, NY).

Amansia multifida Lamouroux

Dredged in 13 meters of water, off Pt. Brea, near Guánica Harbor, M. A. Howe *7620*, *7636*, 10 July 1915 (IMB, NY); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4350*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY, UC, US).

Source: MNHN, P

Chondria littoralis Harvey

Dredged, in 13 meters of water, Pt. Brea, near Guánica, M. A. Howe *7624*, 10 July 1915 (NY); on rocks, in sand, strong wave action, Tamarindo, L. R. Almodovar & V. M. Rosado *3941*, 16 Feb. 1961 (IMB, NY); on rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4419*, 16 Feb. 1962 (COL, L, DUKE, IMB, L, NY, UC, US).

Vidalia obtusiloba (Mert.) J. Agardh

Dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7411*, 4 July 1915 (NY); dredged in 15 meters of water, off the mouth of Guánica Harbor M. A. Howe *7435*, 4 July 1915 (NY); dredged in 14 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7638*, 10 July 1915 (NY); washed ashore, on sandy beach, near Tamarido, Caña Gorda, L. R. Almodovar & V. M. Rosado *3933*, 15 Feb. 1961 (COL, D, DUKE, IMB, L, NY, UC, US); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4357*, 6-8 Dec. 1961 (IMB).

Acanthophora muscoides (L.) Bory

On rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4344*, 6-8 Dec. 1961 (COL, D, DUKE, IMB, L, NY, UC); on rocks, small inlet, west of Ventana, L. R. Almodovar & V. M. Rosado *4444*, 16 Feb. 1962 (IMB, NY); on rocks, in about 15 feet of water, L. R. Almodovar & V. M. Rosado *4451*, 28 Mar. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Acanthophora spicifera (Vahl) Börgesen

On stones near l.t.m., M. A. Howe *2594*, 26 June 1903 (NY); very common, Lemon Bay, M. A. Howe *2664*, 27 June 1903 (NY); in 2 dm. of water, in shallow place behind a reef, Ballena Bay, near Guánica, M. A. Howe *6948*, 20 June 1915 (IMB, NY); dredged in 9-12 meters of water, east of the mouth of Guánica Harbor, M. A. Howe *7078*, 23 June 1915 (NY); in shallow water, in *Rhizophora* association, Guánica Harbor, M. A. Howe *7042*, 23 June 1915 (NY); dredged in 7 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7410*, 4 July 1915 (NY).

**Laurencia microcladia* Kütz.

On rocks, small inlet, west of Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4430*, 16 Feb. 1962 (COL, D, DUKE, IMB, L, NY, UC, US).

Source MNHN Paris

Laurencia obtusa (Huds.) Lamx

On surf between rocks, M. A. Howe *2638*, 28 June 1903 (IMB, NY); on rocks, n.l.t.m., Salinas Bay, M. A. Howe *2679*, 29 June 1903 (IMB, NY); on rocks in 3-6 dm. of water, mouth of Guánica Harbor, M. A. Howe *6977*, 21 June 1915 (IMB, NY); dredged in 9 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7378*, 4 July 1915 (NY); on rocks in shallow water, west side of Guánica Bay, H. L. Blomquist *13010*, 31 Mar. 1942 (DUKE, IMB); on rocks, small inlet, west of Ventana, between Ventana and Tamarindo, L. R. Almodovar & V. M. Rosado *4435*, 16 Feb. 1962 (DUKE, IMB, L, NY); on rocks, near l.t.m., Lemon Bay, M. A. Howe *2634*, 27 June 1903 (NY).

Laurenca papillosa (Forsk.) Greville

On rocks at lt.tm., Salinas Bay, M. A. Lowe 2682, 29 June 1903 (IMB, NY); on rocks, in 1-6 dm. of water, mouth of Guánica Harbor, M. A. Howe *6969*, 21 June 1915 (IMB, NY); on rocks and stones, Salinas Cove near Guánica Harbor, M. A. Howe *7205*, 27 June 1915 (IMB, NY); common in 2-6 dm. of water, behind a reef, east of the mouth of Guánica Harbor, M. A. Howe *7305*, 1 July 1915 (IMB, NY); on rocks, in shallow water, west side of Guánica Bay, H. L. Blomquist *13006*, 31 Mar. 1942 (DUKE, IMB); on rocks at low water mark, Guánica Bay H. L. Blomquist *13035*, 31 Mar. 1942 (DUKE, IMB).

Laurencia poitei (Lamx.) M. A. Howe

Dredged in 40-50 meters of water, east of mouth of Guánica Harbor, M. A. Howe *7107*, 23 June 1915 (NY); dredged in 6 meters of water, off the mouth of Guánica Harbor, M. A. Howe *7364*, 2 July 1915 (NY); dredged in 7 meters of water, M. A. Howe *7412*, 4 July 1915 (NY); dredged of Bahia Salinas, west of Punta Brea, in 15-20 meters of water, L. R. Almodovar, J. Rivera, P. & F. Rosado *3851*, 28 Sept. 1959 (IMB); on rocks, Tamarindo, L. R. Almodovar & V. M. Rosado *4345*, 6-8 Dec. 1961 (IMB, NY).

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Source MNHN, P

Algae of Southern Arizona

Part. II Algal Flora (Exclusive of Blue-Green Algae)

Roy E. CAMERON.

■

The algal flora of southern Arizona is represented primarily by blue-green algae occurring in desert areas. A description of the blue-green algae collected and examined was given in the previous issue of this publication. These algae, along with representatives of other algal groups, were collected mostly from the Sonoran Desert (CAMERON, 1961). The Sonoran Desert has sharp boundaries in certain areas of southern Arizona where there is an abrupt change in elevation and climate, but in other areas it merges into other desert regions, e. g. the Mohave Desert in the northwestern part of the state. The climate is comparable to that of other hot, subtropical deserts and humidity types range from absolute at Yuma to mediterranean at Phoenix, or frosty at Tucson (PAPADAKIS 1961, p. 148). The evaporation rate is one of the highest in the United States, particularly in the summer months. The soils are thoroughly dry for extended periods of time, the surface temperature becomes exceedingly high, and moisture is primarily limited to areas of brief and sudden downpour or rapid run-off which is carried through dry arroyos and stream beds for some distance into the desert. It is during these brief periods of available moisture that the algae are most noticeable and oscillatorioid forms can quickly cover an extensive area. Small depressions in the soil are then capable of retaining moisture for an extended period of time and even the slower growing species make some growth during this period of available moisture.

The desert is by no means limited to blue-green algae, and even the soil contains green and yellow-green algae, and diatoms. As has been noted previously (CAMERON 1960, p. 85) green algae were found in approximately one-quarter of the soil crusts examined. In the driest soils these algae are coccoid, unicellular or colonial green forms. Filamentous green algae, yellow-green algae and diatoms were found in areas where the moisture supply was more dependable for a longer period of time. However, since the forms found in desert soils were usually parasitized or lichenized, it is possible that the observed coccoid forms were actually single-celled

Source MNHN, Paris

of few-celled filamentous algae. The extensive parasitism and lichenization of algae in the Sonoran Desert, as well as the Mohave Desert (DROUET 1958, p. 96), is apparently not found in the more extensive and harsh Sahara Desert (THORNTON 1952, p. 301). A few permanent and semi-permanent rivers and streams and other small bodies of water are found in the Southern Arizona desert area and these have been investigated to a limited extent. Only a few fairly common species were found.

Algae of the following groups were examined : GREEN ALGAE : Volvocaceae — *Pandorina* Bory, *Protococcus* Ag.; Tetrasporaceae — *Palmogloea* Kuetz., *Tetraspora* Link; Ulothricaceae — *Microspora* Thur., *Stichococcus* Naeg., *Ulothrix* Kuetz.; Chaetophoraceae — *Aphanochaete* (Naeg.) A. Br., *Chlorotylium* Kuetz., *Draparnaldia* Bory, *Phytoconis* Bory, *Stigeoclonium* Kuetz.; Ulvaceae — *Enteromorpha* Link; Cladophoraceae — *Cladophora* Kuetz.; *Pithophora* Wittr., *Rhizoclonium* Kuetz.; Oedogoniaceae — *Oedogonium* Link; Characiaceae — *Characium* A. Br.; Hydrodictyaceae — *Hydrodictyon* Roth; Protosiphonaceae — *Protosiphon* Klebs.; Oocystaceae — *Ankistrodesmus* Corda, *Chlorella* Beij., *Oocystis* Naeg., *Trochiscia* Kuetz.; Scenedesmaceae — *Scenedesmus* Meyen; Zygnemataceae — *Cylindrocystis* Menegh.; Desmidiaceae — *Closterium* Nitzsch, *Cosmarium* Corda, *Oocardium* Naeg., *Pleurotaenium* Naeg.; Characeae — *Chara* Vaill. ex L. *Nitella* Ag., *Tolypella* (A. Br.) Leonh.; YELLOW-GREEN ALGAE : Tribonemataceae — *Tribonema* Derb. & Sol.; Botrydiaceae — *Botrydium* Wallr.; Vaucheriaceae *Vaucheria* DC.; Chrysomonads — Ochromonadaceae — *Ochromonas* Wyssotzki; DIATOMS; EUGLENOIDS : Euglenaceae — *Euglena* Ehrenb., *Phacus* Dujard.; DINOFLAGELLATES : Peridiniaceae — *Peridinium* Ehrenb.; RED ALGAE : Erythrothrichiaceae — *Compsopogon* Montl.; Batrachospermaceae — *Batrachospermum* Roth.; Thoreaceae — *Thorea* Bory.

The specimens cited are mostly contained in the herbarium of the author; others cited are in the herbarium of Francis DROUET, indicated by the abbreviation (D), and those in the herbarium of the University of Arizona, Tucson, by the abbreviation (A.). It should be understood that specimens listed without the name of a collector are those of the author. All other abbreviations, except ca. for « *circa* », Mon. for « Monument », and Hwy. for « Highway », are those listed in *Webster's New International Dictonary*, Second Edition, unabridged.

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Source MNHN, P

GREEN ALGAE

VOLVOCACEAE

Plants aquatic, plate-like, spherical or ellipsoid, one- or many-celled; cells pyriform or hemispherical, each biflagellated and containing two contractile vacuoles, an eyespot, a parietal chloroplast with one or more pyrenoids, and a cellulose wall surrounded by a gelatinous sheath; in some species the protoplasts of adjacent cells connected by protoplasmic strands; reproduction by the release of daughter plants formed within the parent plant, by the release of biflagellate or nonmotile cells, or by the union of morphologically similar or dissimilar biflagellate or nonmotile gametes.

PANDORINA Bory, Encycl. Meth., Hist. Nat. Zooph., 2 : 521. 1824. — Plants microscopic, spherical or ellipsoid, of four to thirty-two cells in the periphery of a hyaline, gelatinous matrix; cells pyriform; chloroplast cup-shaped, containing one pyrenoid.

Pandorina morum (Muell.) Bory, loc. cit. 1824. — Plants 20-45 μ across, 20-45 μ long; cells 8-16 μ across.

Specimens examined : SANTA CRUZ COUNTY : Pena Blanca Lake, *McConnell 921, 922*, Aug. 1959.

PROTOCOCCUS Ag., Syst. Alg., p. XVII. 1824. — Plants unicellular, green or red, aquatic or on moist substrata; motile cells ellipsoid to spherical, the walls often hydrolyzing and containing fine protoplasmic threads extending to the periphery; cells when nonmotile becoming spherical, enlarging, and developing thick, gelatinous, often stratified walls.

Protococcus grevillei (Ag.) Crouan, Flor. du Finist., p. 109. 1867. — Cells 8-80 μ across. — This is the species referred to by various authors under the names *Haematococcus pluvialis* Flotow. and *Sphaerella lacustris* (Girod.) Wittr. (see Drouet & Daily, 1956, p. 152). The plants are found in red strata in concrete containers, pools in rocks, and soil kept moist for some time.

Specimens examined : COCHISE COUNTY : in cattle tank 18. 1 mi. n. of Pomerene, Cameron, Drouet & Hevly *460*, Nov. 1960. GILA COUNTY : Hwy. 60-70, 1 mi. w. of Globe, *785*, Nov. 1960. GREENLEE COUNTY : in a dried pool in rocks below the dam of a pond beside Hwy. 666, 13 mi. s. w. of Clifton, Drouet & Hevly *14535 (D)*, Oct. 1960. MARICOPA COUNTY : Arizona Citrus Farm, Mesa, *A43a, A45a*, Feb. 1957; Tempe, *A89a*, Aug. 1957; Hwy 85, 5 mi. s. of Gila Bend *240*, Nov. 1959. PIMA COUNTY : in a dried rain pool at Quitobaquito, Organ Pipe Cactus Nat. Mon., Drouet & Hevly *14503 (D)*, Oct. 1960; Tucson, *A87a, 55, 58, 81, 207*, Torgerson *881*, Aug. 1957, 1959, Nov. 1959, June 1960; Mt. Lemmon Rd., ca. 5 mi. s. of Santa Catalina Mts., *221*, Nov. 1959; 1 mi. e. of Silverbell, *332*, Dec. 1959; in a pool, lower Molino Basin, Santa Catalina Mts.,

Source MNHN Paris

TORGERSON *534*, July 1959; Hwy. 286, Brawley Wash, 18 mi. s. of Robles Junc., *844*, *845*, Dec. 1960. YAVAPAI COUNTY : Hwy. 93, 6 mi. w. of Congress, CAMERON & HEVLY *252*, *253*, Nov. 1959; Hwy. 71, 1 mi. w. of Congress Junc. and 5.5 mi. s. w. of Congress, CAMERON & HEVLY *561*, *563*, *564*, *569*, Nov. 1960. PINAL COUNTY : Hwy. 80-89, Bogard Wash, 25 mi. s. of Florence, *813*, *814*, Dec. 1960. YUMA COUNTY : Hwy. 80, San Cristobal Wash, 7 mi. w. of Dateland, CAMERON & HEVLY *713*, Nov. 1960.

TETRASPORACEAE

Plants gelatinous, micro- or macroscopic, cushion-shaper or sac-like; cells bi- or nonflagellate, imbedded in the gelatinous matrix; chloroplast parietal; reproduction by fragmentation, by the release of biflagellate cells or by the union of morphologically similar billagellate gametes.

PALMOGLOEA Kuetz., Phyc. Gener., p. 176. 1843. — Plants uni- or multicellular in layers or cushions; cells dividing transversely, at first hemispherical or hemi-ellipsoidal, becoming spherical, ovoid or spindle-shaped, irregularly or regularly distributed within the gelatinous matrix; chloroplast cup-shaped, lacking a pyrenoid; motile cells not known.

Palmogloea protuberans (Sm. & Sow) Kuetz., *loc. cit.* 1843. — Plants blue-green, green, black or red; cells 2-15 μ across; chloroplasts sometimes obscured by haematochrome; gelatinous matrix hyaline, becoming blue, red, or brown, homogeneous or with lamellations about each cell or group of cells. This species is treated by many authors as *Gloeocystis confluens* (Kuetz.) Richt. and other *Gloeocystis* spp. (See DROUET & DAILZ, 1956, pp. 137-142). On damp soil.

Specimens examined : MARICOPA COUNTY : Arizona Citrus Farm, Mesa, *Fuller A37*, Jan. 1957, MOHAVE COUNTY : around white quartz, Hwy. 66, 0.5 mi. s. and 3 mi. s. of McConnico, CAMERON & HEVLY *614*, *616*, Nov. 1960. PIMA COUNTY : Univ. of Ariz., Tucson, CAMERON & DROUET 887, Jan. 1961. SANTA CRUZ COUNTY : Hwy 82 by Sonoita Cr., 2 mi., s. w. of Patagonia, CAMERON & DROUET *158*, Oct. 1959.

TETRASPORA Link in Schrader's Neues Journ. f. d. Bot. 3 : 9. 1809. — Plants membranaceous, sac-like or tubular; cells spherical, biflagellate, in the peripheral layer of the gelatinous matrix, usually in twos and fours.

Tetraspora gelatinosa (Vauch.) Desv., Observ. s. l. Pl. Envir. de Angers, p. 18. 1818. — Cells 3-17 μ across, In flowing water.

Specimens examined : GILA COUNTY : Gila R., 5 mi. n. of Winkelman, *766*, Nov. 1960. MARICOPA COUNTY : Tempe Canal, Mesa, WIEN *(D)*, Apr. 1959. PIMA COUNTY : Arivaca Cr., 6 mi. w. of Arivaca, *856*, *857*,

Source MNHN Pa

858, 859, Dec. 1960; Santa Cruz R. near Congress St., Tucson, *879, 880*, Dec. 1960; in creek in Brown's Canyon between Brown's well and the ranch house at the s. end of Baboquivari Mts., DROUET & HEVLY *14446 (D)*, Feb. 1960; Molino Basin, Santa Catalina Mts., FAUST *929*, Feb. 1961. SANTA CRUZ COUNTY : in a pool below Yank's Spring, Sycamore Canyon, as *Prasiola nevadensis*, DROUET & B. C. GRANT *14675 (D)* Apr. 1961.

ULOTHRICACEAE

Plants green, resembling masses of hair, filaments unbranched, each a single row of uninucleate cells; chloroplast a parietal disk or band; reproduction by fragmentation, by the release of bi- or quadriflagellate or nonmotile cells, or by the union of morphologically similar or dissimilar gametes.

MICROSPORA Thur., Ann. Sci. Nat. Bot. III, 14 : 221. 1850. — Plants usually unattached; cell layers so constructed that when filaments break the pieces remain in the shape of cylinders open at both ends; chloroplast a granular band or sheet, lacking pyrenoids.

Microspora stagnorum (Kuetz.,) Lagerh. Ber. Deutsch. Bot. Ges. 5 : 417. 1887. — Cells cylindrical, or slightly constricted at the cross-walls, 7-9 μ across, up to three times as long as wide.

One collection : SANTA CRUZ COUNTY : Bell Spring, Mt. Wrightson Santa Rita Mts., FAUST *942*, May 1961.

Microspora lumidula Hazen, Mem. Torr. Bot. Club 11 (2) : 177. 1902. Cells nearly cylindrical, sligtly constricted at the cross-walls, 7-10 μ across, up to twice as wide.

Specimens examined : GRAHAM COUNTY : in stream from warm artesian well between Safford & Artesia, FELGER *832*, Dec. 1960. SANTA CRUZ COUNTY : Hwy. 82, Sonoita Cr., 2 mi. s. w. of Patagonia, CAMERON & DROUET *166*, Oct. 1959; in intermittent stream 6 mi. e. of Arivaca, *863*, Dec. 1960.

Microspora willeana Lagerh. in De Toni, Syll. Alg. 1 : 228. 1889. — Cells cylindrical, 11-14 μ across, 6-25 μ long.

One collection : MOHAVE COUNTY : Hwy. 93, Burro Cr., CAMERON & HEVLY *287*, Nov. 1959.

Microspora wiltrockii (Wille) Lagerh., Ber. Deutsch. Bot. Ges. 5 (8) : 417. 1887. — Cells cylindrical, 19-22 μ across, 19-45 μ long.

One collection : MARICOPA COUNTY : in a lateral ditch, Beardsley, WIEN *59 (D)*, Oct. 1957.

STICHOCOCCUS Naeg., Neue Denkschr. Allgem. Schweiz. Ges. 10 : 76, 77. 1849. — Filaments of few to many cells; chloroplast a parietal, curved disk or plate covering not more than half of the cell wall, containing one pyrenoid.

Source MNHN Paris

Stichococcus subtilis (Kuetz.) Klerck., Flora 82 :103. 1896 — Plants on moist substrata; cells cylindrical, 5-7 μ long. — Where these plants are parasitized by fungi, the filaments break up into short segments.

Specimens examined : COCHISE COUNTY : scrapings from inside concrete cattle tank 4.6 mi. n. of Pomerene, CAMERON, DROUET & HEVLY *448*, Nov. 1960; in seepage on soil by bathhouse steps, Hooker's Hot Springs, CAMERON, DROUET & HEVLY *471a*, *489*, Nov. 1960; around white quartz, 6. 2 mi. e. of Willcox-Cascabel junc., CAMERON, DROUET & HEVLY *469*, Nov. 1960. GILA COUNTY : Hwy. 77, 3 mi. n. of Winkelman, *763*, Nov. 1960. MARICOPA COUNTY : by storm sewer outlet, Hassayampa Cr., Wickenburg, CAMERON & HEVLY, *540*, Nov. 1960; by cooling tower, Chandler,*Faust 935*, Mar. 1961. MOHAVE COUNTY : Hwy. 93, by Burro Cr., CAMERON & HEVLY 282, Nov. 1959; around moist rocks, Kingman, CAMERON & HEVLY *608*, Nov. 1960. PIMA COUNTY : Tucson, *A28*, *535*, Jan. 1957, Apr. 1959; Univ. of Ariz., Tucson, CAMERON & DROUET *888*, *891*, *893*, *895*, Jan. 1961; lower Molino Basin, Santa Catalina Mts., *300*, *303*, Nov. 1959; 1 mi. e. of Silverbell, *330*, Dec. 1959; Hwy. 80, 3 mi. w. of Cienega Cr., CAMERON, DROUET & HEVLY *441*, Nov. 1960; Hwy. 93-89, 3 mi. s. of Sahuarita, *316*, Dec. 1959; Hwy. 83, 11 mi. s. of Mountainview, CAMERON & DROUET *155*, Oct. 1959; Hwy. 86, 0.75 mi. w. of Robles Junc., and 36 mi. w.of Quijotoa, *222*, *234*, Nov. 1959; PINAL COUNTY : Hwy. 77, 0.1 mi. e. of Oracle and 4 mi. n. of Mammoth, *728*, *735*, Nov. 1960; Hwy. 80-89, Tom Mix Wash and 22 mi. s. of Florence, *815*, *818*, Dec. 1960. YAVAPAI COUNTY : Hwy. 93, Congress and 6 mi. w. of Congress, CAMERON & HEVLY *224*, 565, Nov. 1959, 1960. YUMA COUNTY : Hwy. 95, ca. 9 mi. n. of Yuma, CAMERON & HEVLY *684*, Nov. 1960; Hwy. 80 Gila Mts., Telegraph Hill Pass, CAMERON & HEVLY *699*, Nov. 1960.

ULOTHRIX Kuetz., Flora 16 : 517. 1833. — Each filament attached by a rhizoid-like basal cell; chloroplast a homogeneous, parietal band, containing one to several pyrenoids.

Ulothrix tenerrima Kuetz., Phyc. Gener., p. 253, Pl. 9, fig. 1. 1843. — Cells cylindrical 7-9 μ across, 5-12 μ long.

Specimens examined : MARICOPA COUNTY : on bottom of stream from hot spring, Agua Caliente, CAMERON & HEVLY *405*, *410*, *414*, Mar. 1960. PIMA COUNTY : on wet bank of stream, upper Sabino Canyon, *64*, *66*, Aug. 1959.

CHAETOPHORACEAE

Plants consisting of branched filaments, the cells uniseriate: chloroplasts band- or disk-shaped in most species, each containing one or more pyrenoids; reproduction by fragmentation, by the release of bi- or quadriflagellate and nonmotile cells, or by the union of morphologically similar or dissimilar bi- or quadriflagellate gametes.

Source MNHN, P

APHANOCHAETE (Naeg.) A. Br., Betracht. ue. d. Erschein. d. Verjueng. i. d. Natur, p. 196. 1851. — Plants microscopic, epiphytic, prostrate; cells cylindrical or inflated, each bearing one or more long hair-like projections of the wall; chloroplast covering the cell wall more or less completely.

Aphanochaete repens A. Br., *loc. cit.* 1851. — Cells 8-10 μ across; hair-like projections, 3-4 μ thick at the bases, slender above, up to 160 μ long.

One collection : PIMA COUNTY : on *Cladophora crispata*, Univ. of Ariz., Tucson, DROUET & FAUST *14 614 (D)*, Feb. 1961.

CHLOROTYLIUM Kuetz., Phyc. Gener., p. 285. 1843. — Plants calcified, crustaceous; filaments erect and radiate from the base; cells cylindrical, pale cells alternating with more numerous green cells; chloroplast containing one pyrenoid.

Chlorotylium cataractarum Kuetz., *loc. cit.* Pl. 17, fig. 1-5. 1843. — Filaments 6-12 μ across. — In permanently flowing water.

Specimens examined : PINAL COUNTY : Aravaipa Cr., 6 mi. e. and 8.5 mi. e. on Aravaipa Canyon Rd., *746, 753*, Nov. 1960. SANTA CRUZ COUNTY : on rocks leaves & twigs in stream, Hwy. 82, Sonoita Cr., 2 mi. s. w. of Patagonia, CAMERON & DROUET *160*, DROUET & CAMERON *14 437 (D)* Oct. 1959.

DRAPARNALDIA Bory, Ann. Mus. d'Hist. Nat. Paris 12 : 399. 1808. — Plants gelatinous, erect, attached to the substratum by rhizoids; main filament and primary branches large, bearing crowded fascicles of small branchlets, many of whose terminal branches are attenuate into long, hyaline hairs; cells cylindrical or swollen; chloroplasts parietal, band-like in the larger cells, lining the walls in the smaller cells.

Draparnaldia plumosa (Vauch). Ag., Disp. Alg. Suec., p. 42. 1812. — Cells of main filaments 45-70 μ across, 50-200 μ long; those of the branchlets 6-10 μ across, 6-40 μ long.

MARICOPA COUNTY : on rocks in swiftest water, Seven Springs, WIEN *70 (D)*, Dec. 1957.

PHYTOCONIS Bory, Mem. sur les Genres Conferva & Byssus, p. 54. 1795. — Plants multicellular, rarely unicellular, developing as layers or cushions; cells spherical or angularly compressed, dividing in three planes perpendicular to each other; choroplast usually containing a pyrenoid; reproduction by fragmentation and cell division.

Phytoconis botryoides (L.) Bory, *loc. cit.* 1795. — Cells 4-12 μ across. — This species has been treated by most authors under the name *Protococcus viridi* Ag. (See DROUET & DAILY, 1956, p. 164).

Source MNHN, Paris

Specimens examined : MARICOPA COUNTY : by storm sewer outlet, Hassayampa Cr., Wickenburg, CAMERON & HEVLY *539*, Nov. 1960. PIMA COUNTY : Univ. of Ariz., Tucson, *36, 187*, CAMERON & DROUET *890*, July, Oct. 1959, Jan. 1961.

STIGEOCLONIUM Kuetz., *Linnaea* 17 : 90. 1843. — Plants consisting of long branched filaments arising from a basal cushion; branches pointed or attenuated into long, multi-cellular hairs; chloroplast a parietal band containing one or more pyrenoids.

A specimen of *Stigeoclonium lubricum* (Dillw.) Kuetz. not studied by the author, is reported by WIEN (1959, p. 12) from a canal, Higley, Maricopa County.

Stigeoclonium tenue (Ag.) Kuetz., Phyc. Gener. p. 253. 1943. — Cells cylindrical or slightly swollen, 5-10 μ across, 7-30 μ long; branches attenuated into long multi-cellular hairs.

One collection : PIMA COUNTY : on rocks in seepage from Dripping Springs, Oragan Pipe Cactus Nat. Mon., DROUET & HEVLY *14 514 (D)*, Oct. 1960.

ULVACEAE

Specimens of *Enteromorpha intestinalis* (L.) Link, not studied by the author, are reported by WIEN (1959, p. 12) from irrigation canals at Higley and Buckeye, Maricopa County.

CLADOPHORACEAE

Plants aquatic or terrestrial, resembling masses of hair; filaments branched or unbranched; celles uniseriate, chiefly multinucleate, uninucleate in some species; chloroplast net-like, containing many pyrenoids; reproduction by fragmentation, by the release of quadri- or biflagellate cells or nonmotile spores, or by the union of morphologically similar biflagellate gametes.

CLADOPHORA Kuetz., Phyc. Gener., p. 262. 1843. — Plants coarse; each filament becoming abundantly branched, attached by rhizoidal cells, sooner or later breaking free; cells much longer than wide, the walls thick and stratified.

Cladophora crispata (Roth) Kuetz., Phyc. Gener., p. 264. 1843. — Ultimate branches sparingly distributed along the main axis; cells cylindrical, 20-75 μ across, 5-20 times as long as wide. — In permanent bodies of water.

Specimens examined : PIMA COUNTY : Tucson, DROUET 918 Jan. 1961; with *Aphanochaete repens*, Univ. of Ariz., Tucson, DROUET & FAUST *14 616 (D)*, Feb. 1961.

Source MNHN, P

Cladophora glomerata (L.) Kuetz., Phyc. Gener., p. 266. 1843. — Ultimate branches in closely packed clusters; cells 45-150 μ across, 6-7 times as long as wide. — In permanent standing or flowing water.

Specimens examined : COCHISE COUNTY : in cattle tank, ca. 5 mi. s. w. of Sunny-side, PITMANN *933*, Mar. 1961. GILA COUNTY : floating in river, Gila R., Winkelman, and 5 mi. n. of Winkelman, *758*, *760*, *762*, *764*, Nov. 1960. MARICOPA COUNTY : swamp, Stanfield, CAMERON & HEVLY *722*, *723*, *724*, *725*, Nov. 1960. PIMA COUNTY : Univ. of Ariz., Tucson, *520*, *521*, *524*, *526*, July 1959. PINAL COUNTY : Aravaipa Cr., 6 mi. e. and 8.5 mi. e. on Aravaipa Rd., *742*, *743*, *744*, *745*, *752*, Nov. 1960. SANTA CRUZ COUNTY : Pena Blanca Lake, CAMERON & HEVLY *123*, Oct. 1959; Hwy. 86, Sonoita Cr., 2 mi. s. w. of Patagonia, CAMERON & DROUET *161*, *165*, Oct. 1959. YAVAPAI COUNTY : Hwy. 93, Santa Maria. R., CAMERON & HEVLY *255*, *256*, *259*, Nov. 1959.

PITHOPHORA Wittr., Oefvers. K. Sv. Vet.-Akad. Foerhandl., Vol. Extraord. 1877 : 48. 1877. — Filaments irregularly branched, the branches issuing from below the anterior ends of the cells; cells cylindrical or swollen; reproduction by fragmentation and by the release of nonmotile spores from cells with thickened walls.

Pithophora oedogonia (Mont.) Wittr., *ibid.*, p. 55. 1877. — Spores 80-115 μ across, 230-375 μ long, cask-shaped where between cells, ovoid or obtuse-conical where terminal.

Specimens examined : SANTA CRUZ COUNTY : Pena Blanca lake, WIEN *(D)*, GERDES *928*, Nov. 1959, Feb. 1960.

RHIZOCLONIUM Kuetz., Phyc. Gener., p. 261. 1843. — Plants elongate; filaments attached or free, unbranched or bearing short rhizoidal branches; cells cylindrical or slightly swollen.

Rhizoclonium hieroglyphicum (Ag.) Kuetz., Phyc. German., p. 206. 1845. — Cells 10-35 μ across, 10-150 μ long, usually with thin cell walls. — In seepage and in permanent standing or flowing water.

Specimens examined : COCHISE COUNTY : by the upper hot sping, Hooker's Hot Springs, DROUET, CAMERON & HEVLY *14 597 (D)*, CAMERON, DROUET & HEVLY *479*, Nov. 1960. GILA COUNTY : Gila R. 5 mi. n. of Winkelman, *765*, Nov. 1960. GRAHAM COUNTY : in the shallow lake, Indian Hot springs, HEVLY *(D)*, oct. 1960. MARICOPA COUNTY : in the stream from the hot springs, Agua Caliente, CAMERON & HEVLY *411*, *417*, Mar. 1960; Ariz. Canal, Glendate, WIEN *83 (D)*, Oct. 1958. MOHAVE COUNTY : Hwy. 93, Rurro Cr., CAMERON & HEVLY *598*, *599*, Nov. 1960. PIMA COUNTY : in the largest pond and in an irrigation ditch, Arivaca-Tucson june., *17*, *18*, July 1959. SANTA CRUZ COUNTY : Pena Blanca Lake and the spring below the dam, CAMERON & HEVLY *121*, *127*, *129*, Oct. 1959, Hwy. 86, Sonoita Cr., 2 mi s. w. of Patagonia, CAMERON & DROUET *161*, Oct. 1959; in the stream, Canello *533*, Apr. 1959; in a cattle

Source MNHN, Paris

tank, Pena Blanca Canyon *872* Dec. 1960. YAVAPAI COUNTY : Hwy. 93 Santa Maria R., CAMERON & HEVLY *583, 586, 587,* Nov. 1960. YUMA COUNTY : Hwy. 95, Gila Gravity Main Canal ca. 6 mi. n. of Yuma, CAMERON & HEVLY *674, 676,* Nov. 1960.

OEDOGONIACEAE

Plants aquatic, resembling masses of hair; filaments branched or unbranched, each of a single row of uninucleate cells; chloroplasts parietal, net-like, each containing one or more pyrenoids; cell division by rupture of the wall near its anterior end and the formation of a new transverse membrane between daughter nuclei; reproduction by fragmentation, by the release of multiflagellate cells or by nonmotile spores, and by the union of a large nonmotile female gamete and a small multiflagellate male gamete; enlarged female reproductive cells generally containing a single, nonmotile gamete, male reproductive cells producing one or two gametes; male reproductive cells occurring either in the same filaments of the same size, or in dwarf filaments, the male filaments developing from small multiflagellate cells in the latter case.

OEDOGONIUM Link in Nees v. Esenb., Horae Phys. Berol., p. 5. 1820. — Plants attached by basal cells to the substratum, later breaking free; filaments unbranched; vegetative cells cylindrical or enlarged at one end, the terminal cell obtuse-conical; all except the basal cells capable of division, some becoming motile cells or male or female reproductive cells. — In seepage, shallow and running water. — Many specimens were collected in the non reproductive structures which are necessary for the determination of species.

Oedogonium macrospermum West & West, Jour. Roy. Microsc. Soc. London 1897 : 472. 1897 — Small male filaments attached by stipes to the female filaments; motile cells which give rise to the male filament also produced on the same filament as that producing the female reproductive cells; female reproductive cells 38-46 μ across, 34-44 μ long, depressed-spherical or almost spherical, each opening by means of a lid and developing a smooth-walled, almost spherical zygote 36-44 μ across, 32-44 μ long; vegetative cells 10-20 μ across, 30-80 μ long.

One collection : PIMA COUNTY : with *Scytonema crispum,* lower Molino Basin, Santa Catalina Mts., *297b,* Nov. 1959.

CHARACIACEAE

Plants microscopic, uni- or multicellular, attached to other algae; cells variously elongate, uni- or multi-nucleate; chloroplasts

Source MNHN, P

generally parietal and laminate with one or more pyrenoids; reproduction by the release of biflagellate or nonmotile cells, or by the union of morphologically similar or dissimilar biflagellate gametes.

CHARACIUM A. Br. in Kuetz. Spec. Alg., p. 208. 1840. — Cells pyriform, ovoid, subspherical, cyllindrical or spindle-sbaped, some with stipes at the point of attachment.

Characium pringsheimii A. Br., Alg. Unicell. Gen. Nova et Min. Cogn., p. 48 (106). 1855. — Stipe short and attached by a yellow basal disk; cells erect, somewhat oblique, ovoid to short, spindle-shaped, 6-10 μ across, 20-25 μ long.

One collection : PIMA COUNTY : on sterile *Oedogonium* in a shallow pool below the dam, lower Sabino Canyon, DROUET & MATSUDA *14 613 (D)*, Jan. 1961.

HYDRODICTYACEAE

Plants aquatic, net-like, disk-like, or plate-like, each composed of two to many cells; cells becoming multinucleates, each containing one or more pyrenoids; reproduction by internal division of the protoplast into cells which arrange themselves as a minature plant; as the daughter plant enlarges it bursts the mother cell wall; reproduction also by the release and union of morphologically similar biflagellate gametes which form a zygote, from which, by various intermediate stages, the mature plant develops.

HYDRODICTYON Roth., Tent. Flor. German. 3 : 531. 1800. — Plants net-like or sac-like; cells long-cylindrical,, united at the ends to 3-6 other cells.

Hydrodictyon reticulatum (L.) Lagerh. Oefvers. K. Vet.-Akad. Foerhandl. 1883 (2) : 71. 1883. — Plants micro- or macroscopic; cells 5-20 μ across, up to 1.5 cm. long. — In permanent pools or in slowly flowing streams. Specimens not observed by the author are reported by WIEN (1959, p. 12) from canals, Buckeye, Maricopa County.

Specimens examined : MOHAVE COUNTY : Hwy. 93, Burro Cr., CAMERON & HEVLY *286, 288, 289, 290*, Nov. 1959. PINAL COUNTY : San Pedro R. at San Manuel crossing, *517*, Feb. 1959; Aravaipa Cr., 6 mi. e. on Aravaipa Canyon Rd., *747, 748*, Nov. 1960.

PROTOSIPHONACEAE

Plants green or red, terrestrial or aquatic, uni- or multicellular, bladder-like, tubular, spherical or filamentous; cells multinucleate; chloroplasts reticulate or laminate; reproduction by cell division,

Source MNHN, Paris

by internal division of the protoplast to form several to numerous cells which are released as they burst the mother cell wall, or by the union of morphologically similar biflagellate gametes.

PROTOSIPHON Klebs, Beding. der Fortpflanz. bei ein. Alg. und Pilz., p. 222. 1896. — Description as for the family.

Protosiphon cinnamomeus (Menegh.) Dr. & Daily, Butler Univ. Bot. Stud. 12 : 159. 1956. — Young plants 1-50 μ across, up to 5 mm. across when mature. — On moist soil and mud. This plant is referred to by most authors as *P. botryoides* (Kuetz.) Klebs (see DROUET & DAILY, 1956, p. 161).

Specimens examined : PIMA COUNTY : Univ. of Ariz., Tucson, *931, 932, 933*, Mar. 1961; Hwy. 80, 3 mi. w. of Cienega Cr., CAMERON, DROUET & HEVLY *440, 443, 444*, Nov. 1960; Hwy. 286, Altar Valley, 10 mi. s. of Robles Junc., *839, 840*, Dec. 1960; culture (in Highlands Univ., Las Vegas, New Mexico) of soil crust by Oracle Rd., 10 mi. n. of Tucson, SHIELDS *12 (D)*, Jan. 1958; near the largest saguaro, Saguaro Nat. Mon., DROUET, MACEWAN & POPHAM *14 425 (D)*, Oct. 1959. YAVAPAI COUNTY : Hwy. 93, 6 mi. w. of Congress, CAMERON & HEVLY *249*, Nov. 1959. YUMA COUNTY : Bouse Wash, 0.5 mi. s. of Hwy. 72-95 junc., CAMERON & HEVLY *662*, Nov. 1960; Hwy. 95, 0,5 mi. e. of Gila Gravity Main Canal, CAMERON & HEVLY *681*, Nov. 1960.

OOCYSTACEAE

Plants unicellular, aquatic or terrestrial diversely shaped, chiefly uninucleate, the walls ornamented in various species; chloroplasts parietal, each containing a single pyrenoid; reproduction solely by internal division of the protoplast into 2-16 non flagellated cells which are released when the mother cell bursts.

ANKISTRODESMUS Corda in de Carro, Almanach de Carlsb., p. 196. 1838. — Cells needle-like, each gradually tapering to a point at either end.

Ankistrodesmus falcatus (Corda) Ralfs, Brit. Desmid., p. 180, Pl. 34, fig. 3. 1848. — Cells 1.5-3 μ across, 20-100 μ long.

Specimens examined : MARICOPA COUNTY : scrapings from wet place on cooling tower, Chandler, FAUST *934*, Mar. 1961. PIMA COUNTY : wet sand in Ash Cr., Mesqual Rd., Happy Valley, *508*, Mar. 1959; in a sump with *Lyngbya aestuarii*, Tucson, Univ. of Ariz., CAMERON & DROUET *937*, May 1961.

CHLORELLA Beij., Bot. Zeit. 48 : 758. 1890. — Cells spherical or subspherical.

Chlorella vulgaris Beij. *loc. cit.* 1890. — Cells 5-10 μ across.

Specimens examined : COCHISE COUNTY : on wet wood by tepid spring, Hooker's Hot Spring, CAMERON, DROUET & HEVLY *478*,

Source MNHN, P

Nov. 1960. MARICOPA COUNTY : by storm sewer outlet, Hassayampa Cr., Wickenburg, CAMERON & HEVLY *538*, Nov. 1960. MOHAVE COUNTY : in sewage effluent and on fecal matter, Hwy. 66, 1 mi. s. w. of Kingman, CAMERON & HEVLY *600*, *604*, Nov. 1960. PIMA COUNTY : lower Sabino Canyon, Santa Catalina Mts., *314*, Dec. 1959; Univ. of Ariz., Tucson, JORDAN *927*, Feb. 1961. YUMA COUNTY : Hwy. 95, 0.5 mi. e. of Gila Gravity Main Canal, CAMERON & HEVLY *679*, Nov. 1960; in drainage from wash bowl, Hwy. 80, Tacna, CAMERON & HEVLY *709*, Nov. 1960.

OOCYSTIS Naeg. in A. Br., Alg. Unicell. Gen. Nov. et Min. Cogn., p. 94. 1855. — Cells ovoid, ellipsoid, or subcylindrical, with rounded or pointed ends.

Oocystis crassa Wittr. in Wittr. & Nordst., Alg. Aq. Dulc. Exsicc. 8 : 355. 1880. — Cells 8-20 μ across 14-25 μ long; walls slightly thickened at the ends.

Specimens examined : PIMA COUNTY : in seepage on the face of the dam, lower Sabino Canyon, DROUET & MATSUDA *14 612 (D)*, Jan. 1961; in a fish pond, Tucson, CAMERON & DROUET *938*, May 1961. SANTA CRUZ COUNTY : in seepage on the concrete sides of a springpool and in a pool below Yank's Spring, Sycamore Canyon, DROUET, MASON, MACEWAN & PRICE *14 373 (D)*, DROUET & GRANT *14 688 (D)*, Sept. 1959, Apr. 1961.

TROCHISCIA Kuetz., Phyc. Germ., p. 129. 1845. — Cells spherical or subspherical with thick walls bearing spines, ridges, or other projections.

Trochiscia hirta (Lagerh.) Hansg., Hedwigia 27 : 128. 1888. — Cells 8-35 μ across, walls thick, 0.1-0.2 times the width of the cell, hyaline, covered with unequal pyramidal spines, each one quarter the width of the cell. — Thin green films on the lower surfaces of white quartz stones on soil.

Specimens examined : PIMA COUNTY :Mt. Lemmon Rd., ca 5 mi. s. of Santa Catalina Mts., *214a*, Nov. 1959; Hwy. 86, San Vincente junc., *224*, Nov. 1959; Hwy. 286, Sasabe, *854*, Dec. 1960. PINAL COUNTY : Oracle Junc., *A99a*, Sept. 1957; Hwy. 77, 0.1 mi. e. of Oracle, *729*, Nov. 1960; Hwy. 80-89, by Tom Mix Wash, 17 mi. s. of Florence, *820*, Dec. 1960.

SCENEDESMACEAE

Plants microscopic, aquatic, 2-32-celled; cells spherical, ellipsoid, needle-shaped, or pyramidal, walls bearing or lacking spines and ridges; chloroplasts single or several, parietal, each containing one pyrenoid; reproduction by fragmentation or by internal division of the protoplast into cells which arrange themselves as a minature daughter plant; as the daughter plant enlarges, it bursts the mother cell wall.

Source MNHN, Paris

SCENEDESMUS Meyen, Acta Acad. Caes. Leop.-Carol. 14 (2) : 774. 1829. — Plants developing as flat or curved plates; cells ellipsoid or spindle-shaped arranged in a single, alternating, or double row, with their long axes parallel to each other.

Scenedesmus dimorphus (Turp.) Kuetz. Linn. 8 : 609. 1833. — Plants generally of 4-8 cells; cells spindle-shaped, in a single or alternating series; median cells straight, with attenuate ends; outer cells with concave inner margin, ends attenuate; cells 2-6 μ across, 16-24 μ long, with smooth, hyaline walls.

One collection : PIMA COUNTY : among other algae in a fish pond, Tucson, CAMERON & DROUET *938*, May 1961.

Scenedesmus quadricauda (Turp.) Bréb. in Bréb. & God., Alg. des Env. de Falaise, p. 66. 1835. — Plants generally of 2-8 cells; cells oblong-cylindrical with rounded ends, 3-6 μ across, 11-16 μ long, tips of the walls of the outer cells extended into spines.

Specimens examined : PIMA COUNTY : with *Cladophora crispata*, Tucson, DROUET *918*, Jan. 1961; with *Chlorella vulgaris*, Univ. of Ariz., Tucson, JORDAN *927*, Feb. 1961.

ZYGNEMATACEAE

Plants generally aquatic and unattached, mucilagenous, floccose, or ressembling masses of hair; filaments cylindrical, or rarely having short, rhizoidal branches; cells uniseriate; chloroplasts stellate, or axial and laminate, or spiral, ribbon-like and peripheral; reproduction by fragmentation, by the formation of a thick wall around a vegetative cell, and by the union of morphologically similar gametes through a tubular connection established between two cells; or through an opening in the wall between two adjacent cells; union of gametes occurring in either the tubular connection between two cells or in one of the respective cells.

Reproductive structures are necessary in most cases for the determination of the species. Numerous plants referable to species of the genera listed here were collected in the non reproductive state.

MOUGEOTIA Ag., Syst. Alg., p. XXVII. 1824. — Plants yellow-green or light green, floccose; chloroplasts one or two, axial and laminate, each containing two or more pyrenoids.

Mougeotia elegantula Wittr., Bih. K. Sv. Vet.-Akad. Handl. 1 (1) : 40. 1872. — Vegetative cells 3-5 μ across, 50-135 μ long; chloroplast containing 4-8 pyrenoids in a row; zygotes cruciate-quadrate in frontal view, 18-24 μ across. 18-24 μ long, with rounded corners and thick, smooth, hyaline walls.

Source MNHN, P

One collection : COCHISE COUNTY : in a cattle tank, 18.1 mi. n. of Pomerene, CAMERON, DROUET & HEVLY *459, 460,* Nov. 1960.

SPIROGYRA Link in Nees v. Esemb., Horae Phys. Berol., p. 5. 1820. — Chloroplasts spiral, ribbon-like, each containing several to many pyrenoids arranged in a median line.

Spirogyra singularis Nordst., Bot. Not. 1880 : 118. 1880 — Vegetative cells 32-42 μ across, 65-265 μ long; chloroplast single, making 1.5-3 turns; zygotes ellipsoid, 27-36 μ across, 46-70 μ long, with thick, smooth, yellow walls.

One collection : PIMA COUNTY : in a cattle tank Hwy. 80, 3 mi. w. of Cienega Cr., CAMERON, DROUET & HEVLY *447,* Nov. 1960.

Spirogyra teodorescii Trans., Ohio Jour. Sci. 34 : 420. 1934. Vegetative cells 24-30 μ across, 40-90 μ long; chloroplast single, making 1-6 turns; zygotes ellipsoid 26-33 μ across, 45-55 μ long, with thick, smooth, yellow walls.

Specimens examined : PIMA COUNTY : in an intermittent stream, Hwy. 83, 11 mi. s. of Mountainview, CAMERON & DROUET *146, 150,* Oct. 1959.

ZYGNEMA Ag., Syst. Alg., p.77. 1824. — Chloroplast two, stellate, each containing a pyrenoid

Zygnema insigne (Hass.) Kuetz., Spec. Alg., p. 444. 1849. — Vegetative cells 25-35 μ across, 25-60 μ long; zygotes spherical or subspherical, 27-33 μ across, 27-35 μ long, with thick, smooth, yellow-brown walls.

One collection : SANTA CRUZ COUNTY : in an intermittent stream, Warsaw Canyon, 2 mi. w. of Ruby, *868,* Dec. 1960.

MESOTAENIACEAE

Plants microscopic, unicellular or short-filamentous; cells long- or short-cylindrical; cell walls without pores, smooth or rough and spiny; chloroplast stellate, or axial and laminate, or spiral, ribbon-like and peripheral; reproduction by cell division, or by the union of protoplasts in a tube between two cells, the resultant zygote producing 2 or 4 cells upon germination.

CYLINDROCYSTIS Menegh., Cenni sulla Organogr. & Fisiol. d. Alg., p. 5, 26. 1838. — Plant unicellular, cylindrical, generally 2 or 3 times as long as wide; chloroplasts two, axial, composed of radiating longitudinal plates, each chloroplast usually containing one pyrenoid.

Source MNHN, Paris

Cylindrocystis cylindrospora (Bréb.) Dr. & Daily, Leafl. Acad. Biol. 1 : 16. 1953. — Cells 15-30 μ across, up to five times as long as wide.

Specimens examined : COCHISE COUNTY : in seepage on the outside of covered stone tank of the upper hot springs, Hooker's Hot Springs, DROUET, CAMERON & HEVLY *14 596 (D)*, Nov. 1960. SANTA CRUZ COUNTY : in a pool below Yank's Spring, Sycamore Canyon, DROUET & GRANT *14 688 (D)*, Apr. 1961.

DESMIDIACEAE

Plants unicellular and microscopic or multicellular and filamentous or cushion-shaped; cells diversely shaped, each composed of two distinct, morphologically similar half-cells; cell walls transversely segmented, smooth, or rough and spiny, frequently containing iron salts; chloroplasts diverse in appearance and number, containing one to many pyrenoids in each half-cell; reproduction by fragmentation, by transverse cell division after which a new half cell is regenerated by each daughter cell, and by the union of morphologically similar gametes, which unite within a tube formed between cells, the resulting zygote producing 1-4 cells upon germination.

CLOSTERIUM Nitzsch, Neue Schrift. Naturf. Ges. Halle 3 (1) : 60. 1817. — Plants unicellular, elongate, curved or crescent-shaped with attenuate ends; cell walls smooth or more or less ridged, hyaline or yellow to brown; chloroplasts axial, longitudinally ridged in many species; pyrenoids few or many; vacuoles small, terminal, containing calcium sulfate granules; reproduction by cell division or by the union of gametes.

Closterium dianae Ehrenb., Infusionsth., p. 92, Pl. 5, fig. 17. 1838. — Cells 12-35 μ across, usually 10-12 times as long as wide, slightly curved, outer margin curved through 105°-130°, inner margin slightly concave or almost straight, ends attenuate, obtuse; chloroplasts somewhat ridged, containing 3-6 pyrenoids in a row; vacuoles containing many granules.

One collection : PIMA COUNTY : with *Closterium lanceolatum* on wet sand, Ash Cr., Mesqual Rd., Rincon Mts., *508*, Mar. 1959.

Closterium incurvum Bréb., Mém. Soc. Imp. Sci. Nat. Cherbourg 4 : 150, 1856. — Cells 7-16 μ across, 6-10 times as long as wide, crescent-shaped or almost so, outer margin curved through 180°-200°, ends attenuate, acute; chloroplasts containing 5 or 6 pyrenoids in a row; vacuoles indistinct.

Source MNHN, P

One collection : SANTA CRUZ COUNTY : in a pond 1 mi. e. of Sonoita, DROUET & HEVLY *14 482 (D)*, Sept. 1960.

Closterium lanceolatum Kuetz., Phyc. German., p. 130. 1845. — Cells 30-75 μ across 5-10 times as long as wide, lance-shaped, almost straight, outer margin curved through 30°-55°, ends gradually attenuate, acute; chloroplasts having 7 or 8 ridges, containing 6 or 7 pyrenoids in a median row; vacuoles containing many granules. — In temporary pools and in seepage.

Specimens examined : PIMA COUNTY : in a shallow pool, Tucson, *51, 53, 54, 55, 56,* Aug. 1959; Ash Cr., Mesqual Rd., Rincon Mts., *508,* Mar. 1959.

Closterium turgidum Ehrenb., Infusionsth., p. 95, Pl. 6, fig. 7. 1838. — Cells 30-75 μ across, 11-12 times as long as wide, outer margin curved through 45°-55°, ends gradually attenuate, subtruncate, recurved; chloroplast having seven or eight ridges, containing 7-10 pyrenoids in a median row; vacuoles containing many granules.

One collection : SANTA CRUZ COUNTY : in a pond 1 mi. e. of Sonoita, DROUET & HEVLY *14 479 (D)*, Sept. 1960.

COSMARIUM Corda in de Carro, Almanach de Carlsh., p. 205. 1835. — Plants unicellular, usually a little longer than wide, generally compressed, symmetrical in three planes at right angles to each other, variously constricted in the middle; half-cells ellipsoid, subspherical, hemispherical, truncate-hemispherical, truncate-pyramidal, or kidney-shaped; walls smooth, ornamented with granules or minute projections; chloroplasts 2-4, axial composed of curved, radiating plates, each chloroplast containing one or two large pyrenoids; reproduction by cell division or by the union of gametes.

Cosmarium meneghinii Bréb. in Ralfs, Brit. Desm., p. 96. 1848. — Half-cells truncate-pyramiddal, 14-26 μ across in the axis parallel to the bases, 13-18 μ across in the axis at right angles to this axis and parallel to the bases, 7-10 μ across in the axis perpendicular to the bases; walls smooth or ornamented with indistinct granules.

One collection : PIMA COUNTY : with *Lyngbya aestuarii* in a pool, Tucson, *175,* Oct. 1959.

Cosmarium reniforme (Ralfs) Arch., Jour. of Bot. 12 : 93. 1874. — Half-cells kidney-shaped, 44-67 μ across in the axis parallel to the bases, 36-62 μ across in the axis at right angles to this axis and parallel to the bases, 24-32 μ across in the axis perpendicular to the bases; wall ornamented with coarse granules.

One collection : SANTA CRUZ COUNTY : with *Closterium incurvum* in a pond 1 mi. e. of Sonoita, DROUET & HEVLY *14 482 (D)*, Sept. 1960.

Cosmarium subtumidum Nordst., Hedwigia 17 : 105. 1878. — Half-cells truncate-pyramidal to hemispherical, rounded at the

Source MNHN, Paris

bansces, 26-40 μ across in the axis parallel to the bases, 24-34 μ across in the axis at right angles to this axis and parallel to the bases, 14-20 μ across in the axis perpendicular to the bases, walls ornamented with fine granules.

One collection : SANTA CRUZ COUNTY : with sterile *Spirogyra* in a metal cattle tank, Pena Blanca Canyon, *871*, Dec. 1960.

OOCARDIUM Naeg., Gatt. Einz. Alg., p. 75. 1849. — Plants multicellular, calcified, hemispherical, cushion-shaped, or layered, the single cells at the ends of broad, gelatinous, dichotomously branched tubes; cells Cosmarium-like, slightly constricted, the walls smooth; chloroplasts one in each half-cell, each containing one pyrenoid; reproduction by fragmentation and by the union of gametes.

Oocardium stratum Naeg., *loc. cit.*, Pl. 3A. 1849. — Half-cells 16-20 μ across in the axis parallel with the bases, 8-12 μ across in the axis at right angles to this axis and parallel with the bases, 6-10 μ across in the axis perpendicular to the bases; zygote an irregular parallelipiped.

One collection : COCHISE COUNTY : McClure Canyon (branch of Garden Canyon), Huachuca Mts., MASON *(D)*, Nov. 1959.

PLEUROTAENIUM Naeg., Gatt. Einz. Alg., p. 104. 1849. — Plants unicellular, elongate, straight, cylindrical, slightly constricted in the middles, several times as long as wide; half-cells frequently inflated above the bases, the ends slightly attenuate, somewhat truncate; walls usually ornamented with granules or minute projections, rarely smooth; chloroplasts numerous, straight to undulate, band-like, parietal, rarely axial, containing numerous pyrenoids.

Pleurotaenium maximum (Reinsch) Lund, De Desmid. quae in Suec. Inv. sunt Observ. Crit., p. 89. 1871. — Cells 495-855 μ long, 30-85 μ across; half-cells inflated above the bases, ends slightly attenuate, truncate, smooth; walls ornamented with granules.

Specimens examined : PIMA COUNTY : with *Scytonema crispum* in Sabino Canyon, DROUET, RICHARDS, B. DARROW & OLMSTEAD *2739 (D)*, *2741 (D)*, Oct. 1939.

CHARACEAE

Plants aquatic, macroscopic, multicellular, erect, attached to the substratum by rhizoids, branched, consisting of a regular series of nodes and internodes, frequently encrusted with calcium carbonate; male and female reproductive structures borne on the same plant or on separate plants; each node bearing leaves and branches, u-

Source MNHN, P

sually of limited growth; reproduction by fragmentation and by the union of motile and nonmotile gametes; female gametes large, nonmotile, solitary, their walls surrounded by a compact sheath of sterile filaments; male gametes small, motile, produced within filaments of 5-50 cells, several of which are surrounded by a spherical sheath of sterile cells. — The specimens of the various species listed in this family have all been studied and named by Mrs. Fay K. DAILY.

CHARA Vaill. ex L., Gen. Pl., p. 491. 1754. — Branches arising singly at a node; leaves unbranched, in whorls of 6-16, each leaf subtented by one or two spine-like cells; the anterior end of the sheath of the female reproductive cells ending in a single tier of five cells; female reproductive structures solitary, always borne above the male reproductive structures if the latter are present.

Chara contraria A. Br. — A specimen, not observed by the author, is reported by BRITTON and KEARNEY (1894, p. 21) from Ft. Huachuca, Cochise Co., WILCOX, 1892-1893; another specimen, not observed by the author, is reported by MCCLEARY (1957, p. 152) from a small lake at Papago Park, Tempe, Maricopa Co.

Specimens seen : GILA COUNTY : in a cattle tank 1 mi. s. of Cutter, DROUET & HEVLY *14 530 (A)*, Oct. 1960. MOHAVE COUNTY : in pools by Burro Cr., HEVLY & CAMERON *138 057 (A)*, Nov. 1959 (see HEVLY, 1961, p. 90). SANTA CRUZ COUNTY : in a pond 1 mi. c. of Sonoita, DROUET & HEVLY *14 483 (A)*, Sept. 1960. YAVAPAI COUNTY : in pools in n. fork of Santa Maria R., CAMERON & HEVLY *255, 587*, HEVLY & CAMERON *138 058 (A)*, Nov. 1959, 1960 (See HEVLY, 1961, p. 90).

Chara globularis Thuill.

Specimens seen : COCHISE COUNTY : at the upper pond, Zinn Ranch, St. David, GOODDING *1-61 (A)*, Jan. 1961; in a cattle trough, 4.6 mi. n. w. of Pomerene, DROUET, HEVLY & CAMERON *14 576 (A)*, Nov. 1960. SANTA CRUZ COUNTY : in pools below dam, and in Pena Blanca Lake, HEVLY & CAMERON *133 656 (A)*, *138 056 (A)*, GERDES *133 990 (A)*, Oct. 1959, Jan., Feb. 1960 (see HEVLY, 1961, p. 90).

Chara hypnoides Robins.

One collection : GILA COUNTY : with *Chara contraria* in a cattle tank 1 mi. s. of Cutter, DROUET & HEVLY *14 530 (A)*, Oct. 1960.

Chara sejuncta A. Br.

One collection : PIMA COUNTY : in the stream feeding the lake at Quitobaquito, Organ Pipe Cactus Nat. Mon., MASON, KIDWELL & HEVLY *1 772 (A)*, May 1959 (see HEVLY, 1961, p. 90).

Chara vulgaris L.

Specimens seen : COCHISE COUNTY : in a cattle tank halfway between Chiricahua Nat. Mon. and Portal, DROUET & HEVLY *14 469 (A)*, Sept. 1960; in Cave Cr., 1 mi. above the S. W. Research Sta. of Am. Mus. of Nat. Hist. w. of Portal, DROUET & HEVLY *14 477 (A)*, Sept. 1960.

Source MNHN, Paris

Chara zeylanica Klein. — A specimen of this species, not observed by the author, is reported by McCleary (1957, p. 152) from a small lake at Papago Park, Tempe, Maricopa County.

Chara zeylanica f. *macilenta* (A. Br.) Daily.

One collection : GRAHAM COUNTY : in the outlet of the swimming pool near the lake, Indian Hot Springs, Hevly *(A)*, Oct. 1960.

NITELLA Ag., Syst. Alg., p. XXVII. 1824. Branches arising two at a node; leaves once to repeatedly forked; the anterior end of the female reproductive structure endding in two tiers of five cells each; female reproductive structures solitary, borne below or beside the male reproductive structures if the latter are present.

Nitella clavata A. Br.

One collection : SANTA CRUZ COUNTY : Pena Blanca Lake, Gerdes *133 988 (A)*, Feb. 1960 (see Hevly, 1961, p. 89).

Nitella hyalina (DC. Ag.

One collection : COCHISE COUNTY : in a cattle through 4.6 mi. n. w. of Pomerene, Drouet, Hevly & Cameron *14 575 (A)*, Nov. 1960.

Nitella tenuissima var. *compacta* A. Br.

One collection : COCHISE COUNTY : near Boy Scout cabin, Garden Canyon, Ft. Huachuca (alt. 6,500 ft.), Goodding *130 355 (A)*, June 1959 (see Hevly, 1961, p. 89).

TOLYPELLA (A. Br.) Leonh., Lotos 13 : 72. 1863. — Branches arising two or more at a node; leaves unbranched or forked; the anterior end of the sheath of the female reproductive structure ending in two tiers of five cells each; reproductive structures stalked; female reproductive structures two or more, borne below the male reproductive structures if the latter are present.

Tolypella glomerata Leonh. — A specimen, not observed by the author, is reported by G. O. Allen (1954, p. 81) from s. w. Arizona, Santa Cruz R., Pringle, 1881-1882.

YELLOW-GREEN ALGAE

TRIBONEMATACEAE

Plants yellow or green, resembling masses of hair; filaments unbranched; cells uninucleate, the walls so constructed that when the filaments break, the pieces remain in the shape of cylinders open at both ends; chloroplasts disk-like, producing oil or leucosin, not starch; reproduction by fragmentation, by the formation and release of thick-walled or biflagellate cells, or by the union of morphologically similar gametes.

Source MNHN, P

TRIBONEMA Derb. & Sol., Compt. Rend. Acad. Sci. Paris. 1 (Suppl.) : 18. 1856. — Filaments each at first attached by basal cells, later free-floating; chloroplasts yellow-green, several in a cell.

Tribonema bombycinium (Ag.) Derb. & Sol., *loc. cit.* 1856. — Filaments 6-11 μ across, cells cylindrical, 2-4 times as long as wide; chloroplasts usually numerous. — In seepage and in temporary streams.

Specimens examined : COCHISE COUNTY : Huachuca Canyon, Fort Huachuca, GOODDING *504*, Mar. 1960. PIMA COUNTY : Hwy. 83, 11 mi. s. of Mountainview, CAMERON & DROUET *145*, Oct. 1959; near the summit (over 9,000 ft.), Mt Lemmon, DROUET & MACEWAN *14 410 (D)*, Oct. 1959; Manning Camp, Rincon Mts., FAUST *(D)*, Nov. 1960; Brown's Canyon between Brown's well and the ranchouse, s. end of Baboquivari Mts., DROUET & HEVLY *14 448 (D)*, Feb. 1960.

BOTRYDIACEAE

Plants green, unicellular, multinucleate, ballon-shaped, developing rhizoids at the bases.

BOTRYDIUM Wallr. Annus Bot. in Spreng. Fl. Hal., Suppl. 4 : 153. 1815. — Description as for the family.

Botrydium granulatum (L.) Grev., Alg. Brit., p. 196, Pl. 19, figs. 1-4. 1830. — Plants up to 2 mm. across, often encrusted with calcium carbonate; motile cells 5-8 μ across, 10-20 μ long; thick-walled cells spherical or oblong, up to 50 μ across.

Specimens examined : MARICOPA COUNTY : Arizona Citrus Farm, Mesa, *A45a*, *A46a*, FULLER *A35*, *A37*, Jan., Feb. 1957; on wet bank of stream, Agua Caliente, CAMERON & HEVLY *416*, Mar. 1960. PIMA COUNTY : on bank of cattle tank, Hwy. 80, 3 mi. w. of Cienega Cr., CAMERON, DROUET & HEVLY *442*, *445*, Nov. 1960.

VAUCHERIACEAE

Plants aquatic or terrestrial, tubular, branched, lacking transverse walls, multinucleate; chloroplasts small, disk-like, producing oil, not starch; reproduction by fragmentation, by the release of thick-walled spores or multiflagellate cells or by the union of large, nonmotile female gametes with small, biflagellate male gametes.

VAUCHERIA DC., Fl. Franc., ed. 3, 2 : 61. 1815. — Description as for the family. — For most of the specimens collected and examined, the reproductive structures necessary for the determination of the species were lacking.

Vaucheria geminata (Vauch.) DC. Fl. Franc., ed. 3, 2 : 62. 1815. — Plants felt-like or velvet-like; filaments 30-100 μ across; female

Source MNHN, Paris

reproductive cells one or more with a vertical pore, ovoid or subspherical, 60-80 μ across, 70-90 μ long, attached laterally near the apex of a short branch of the main axis; male reproductive cell circinate or cylindrical, single, terminal on the same branch as the female reproductive cell; zygote ovoid or spherical, with a triple-layed, brown-spotted membrane and completely filling the female reproductive cell.

One collection : SANTA CRUZ COUNTY : in a pool below Yank's Spring, Sycamore Canyon, DROUET & R. C. GRANT *14 674 (D)*, Apr. 1961.

Vaucheria sessilis (Vauch.) DC., Fl. Franc., ed. 3, 2 : 68. 1815. — Plants felt-like or velvet-like; filaments 50-100 μ across, irregularly branched; female reproductive cells one or two, with a pore in a short, more or less oblique beak, ovoid to subspherical, 70-85 μ across, 75-100 μ long; male reproductive cell cylindrical or circinate, on a short pedicel beside the female reproductive cell or between two of them; zygote ovoid or spherical, with a triple-layered, dark spotted membrane, and completely filling the female reproductive cell.

One collection : SANTA CRUZ COUNTY : in a pool below Yank's Spring, Sycamore Canyon, DROUET & R. C. GRANT *14 698 (D)*, Apr. 1961.

CHRYSOMONADS

OCHROMONADACEAE

Plants uni- or multicellular; cells naked or surrounded by wall like structures containing iron salts, silica, or calcium carbonate, the peripheral protoplasm without striations or ridges; flagella of unequal length; chloroplasts one or two, laminate or disk-like, producing oil or leucosin, not starch; reproduction by fragmentation, by longitudinal cell division, or by the release of 2-8 motile daughter cells,

OCHROMONAS Wyssotzki(Trav. Soc. Nat. Univ. Imp. Kharkow 21 : 119. 1887. — Plants unicellular, free-swimming, ellipsoid, ovoid or pyriform; flagella two, of unequal length; contractile vacuoles present; red eyespot present or lacking; chloroplasts laminate, containing leucosin.

Ochromonas Wislouchii Skvortz., z. Bot. Zentralbl. 41 (2) : 312, fig. 1. 1925. — Cells 5-9 μ across, 11-15 μ long; chloroplast single; eyespot at the anterior end.

One collection : PIMA COUNTY : in an aquarium, Univ. of Ariz., Tucson, MCCONNELL *882*, Nov. 1960.

Source MNHN, P

DIATOMS

Numerous species of *Stauroneis* Ehrenb., *Navicula* Bory, *Melosira* Ag., *Epithemia* Bréb., *Pinnularia* Ehrenb., *Amphora* Ehrenb., *Nitzschia* Hass., *Diploneis* Ehrenb., *Synedra* Ehrenb., *Cymbella* Ag., *Rhoicosphenia* Grun., and *Denticula* Kuetz., occur in aquatic and terrestrial habitats in the Sonoran Desert, but they were not identified during the course of this study. Unnamed species of some of these genera were reported previously as occurring on moist soil (CAMERON, 1958, p. 58); *Navicula* spp. are quite common.

EUGLENOIDS

EUGLENACEAE

Cells green or corloless, unicellular, uninucleate, rigid or capable of changing shape; motile by means of one, two, or three flagella and by amoeboid movement; peripheral protoplasm smooth or ornamented; cells naked or surrounded by wall-like structures containing iron salts; chloroplasts disk-like, band-shaped or stellate, containing oil or paramylum; red eyespot present in most species; reproduction by longitudional division, by the formation of more or less spherical, thick- or thin-walled cysts, or by the union of amoeboid gametes.

EUGLENA Ehrenb., Infusionsth., p. 140. 1838. — Cells green, elongate, ellipsoid, lance-shaped, or spindle-shaped, ridged or spirally twisted; flagellum single, bifurcate at the lower end with a granular swelling at the point of branching and at the end of each branch: chloroplasts numerous, containing or lacking pyrenoids; paramylum present.

Euglena gracilis Klebs, Unters. Bot. Inst. Tuebingen 1 : 303. 1883. — Cells ellipsoid to elongate, 6-15 μ across, 25-55 μ long; chloroplasts disk-like, irregularly distributed throughout the cellc; paramylum bodies usually two, flattened, ring-like, attached on either side of the chloroplasts. — In seepage and temporary pools.

Specimens examined : COCHISE COUNTY : by a cattle tank, 18.1 mi. n. of Pomerene, CAMERON, DROUET & HEYLY *463, 464,* Nov. 1960, MOHAVE COUNTY : sewage effluent, Hwy. 66, 1 mi. s. w. of Kingman, CAMERON & HEYLY *601, 602, 605, 606,* Nov. 1960, PIMA COUNTY : w. of Tumamoc Hill, Gates Pass. Rd., Tucson, *86,* Aug. 1959.

Euglena proxima Dang., Le Botaniste 8 : 154. 1902. — Cells somewhat spindle-shaped, narrowed posteriorly to a blunt end,

Source MNHN, Paris

14-20 μ across, 60-90 μ long; chloroplasts disk-like, numerous; paramylum bodies small, rod-shaped, irregularly distributed through the cell.

One collection : COCHISE COUNTY : on wet soil by tepid hot springs, Hooker's Hot Springs, CAMERON, DROUET & HEVLY 477, Nov. 1960.

PHACUS Dujard., Hist. Nat. Zooph., p. 334. 1841. — Cells green, compressed in mosts species, somewhat twisted, each motile by means of a bifurcate flagellum; peripheral protoplasm smooth, longitudinally or spirally striated or ornamented with granules; paramylum bodies disk-like or ring-like.

Phacus acuminatus Stokes, Amer. Mo. Microsc. Jour. 6 : 183. 1885. — Cells compressed-ovoid, 20-25 μ across, 25-35 μ long, each having a very short, straight or curved posterior tail-like projection; peripheral protoplasm ornamented with faint, longitudional striations; paramylum hodies solitary and large or two of different sizes near the posterior end of the cell.

One collection : PIMA COUNTY : with *Euglena gracilis* in a slanding pool, lower Sabino Canyon, DROUET & MATSUDA 917, Jan. 1961.

TRACHELOMONAS Ehrenb., Abh. Akad. Wiss. Berlin 1883 : 315. 1835. — Cells naked, capable of changing shape, surrounded by brown, iron-containing wall-like structures; chloroplasts parietal, disk-like.

Trachelomonas lemmermannii Wolosz., Bull. de l'Acad. des Sci. de Cracovie 1912 : 696, Pl. 5, Fig. 47. 1912. — Wall-like structures ovoid, ornamented with faint granules; cells usually ovoid, 12-15 μ across, 20-26 μ long.

One collection : PIMA COUNTY : with *Euglena gracilis* in a standing pool, lower Sabino Canyon, DROUET & MATSUDA 917, Janv. 1961.

DINOFLAGELLATES

PERIDINIACEAE

Cells brown, each surrounded by a thick cellulose wall composed of plates; flagella two, one long and trailling, the other lying in a transverse groove in the wall; chloroplast disk-like, yellow or brown, producing starch or oil; red eyespot present or lacking; reproduction by cell division, or by the formation of thin- or thick-walled spores.

PERIDINIUM Ehrenb., Abh. Akad. Wiss. Berlin 1830 : 38. 1832. — Cells spherical, ovoid, or angular; walls having evident sutures, bearing small spines at the posterior end in some species; chloroplasts numerous.

Source MNHN, P

Peridinium tabulatum (Ehrenb.) Clap. & Lachm., Mem. Inst. Genevois 6 (1) : 403. 1859. — Cells spherical to ovoid, not at all or slightly compressed, 23-30 (-40) μ across, 30-38 (-48) μ long, bearing two short spines at the posterior end; eyespot lacking.

Specimens examined : SANTA CRUZ COUNTY : Pena Blanca Lake, McConnell *923, 924*, Nov. 1959.

RED ALGAE

ERYTHROTHRICHIACEAE

Specimens of *Compsopogon coerulens* (Balb.) Mont., not observed by the author, are reported by Wien (1959, p. 12) from irrigation canals, Higley, Maricopa County.

BATRACHOSPERMACEAE

Plants aquatic, macroscopic, red, violet, brown, green, blue-green, or gray; multicellular, branched, each having an axial core of large cells and with lateral branches disposed at definite intervals to form nodes and internodes; each node bearing a whorl of branches; chloroplasts each with a pyrenoid, disk-like, solitary in each of the large cells, disk-like or irregular, 2-5 in the branches; male and female reproductive structures borne on the same plant or on separate plants; reproduction by fragmentation, by spores, and by the union of nonmotile gametes; female gametes large, solitary, enclosed within a flask-shaped reproductive structure; male gametes small, produced in clusters at the tips of lateral branches; spores developed by juvenile plants, gametes developed by adult plants.

BATRACHOSPERMUM Roth. Cat. Bot. 1 : 36. 1797. — Plants 20 cm or more in length, gelatinous, hair-like.

One collection : in swift water, upper Sycamore Canyon, Drouet & R. C. Grant *14 672 (D)*, Apr. 1961. Reproductive structures necessary for the determination of the species were lacking.

THOREACEAE

Plants aquatic, macroscopic, red, brown, green, purple or black, multicellular, branched or unbranched, each having an axial core with or without lateral branches disposed along the entire axis; chloroplasts disk-like or irregular, numerous in cells of the erect filaments and outermost cells of the projecting hairs; reproduction

Source MNHN, Paris

by the breaking off of cells of lateral branches; sexual reproduction unknown.

THOREA Bory, Ann. Mus. d'Hist. Nat. Paris 12 : 127. 1808. — Description as for the family.

Thorea ramosissima Bory, *ibid.*, p. 128, Pl. 18, fig. 1. 1808. — Plants 1-3 cm across, up to 1 m long.

One collection : MARICOPA COUNTY : Tempe Canal, Tempe, WIEN *(D)*, Oct. 1957.

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SUMMARY

Among one thousand two hundred random specimens of algae collected in Arizona were found fifty-four species of green algae and twelve other species of nongreen algae (exclusive of blue-green algae). The following list summarizes these taxa of southern Arizona algae :

	Families	Genera	Species
Green algae	16	36	54
Yellow-green algae	5	3	4
Chrysomonads	1	1	1
Euglenoids	1	3	4
Dinoflagellates	1	1	1
Red Algae	3	3	2

At least six species were found to occur in algal soil crusts. Others were found in aquatic and semi-aquatic habitats. The commonest algae occurring in soil crusts included *Protococcus grevillei* (Ag.) Crouan and *Stichococcus subtilis* (Kuetz.) Klerek. These were in many cases found in association with blue-green algae in a parasitized or lichenized condition. The algal flora of southern Arizona and its desert confines has been found to be comparable with that found elsewhere in southwestern United States and northwestern Mexico.

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Source MNHN, Paris

Preliminary survey of the epizoic Oedogonia growing on the shells of freshwater molluscs in East Pakistan

By A. K. M. Nurul ISLAM and Pranjit SARMA

■

Little information is available about the filamentous green algae, particularly *Oedogonium*, growing on the shells of freshwater gastropod and hivalve molluscs. Campion (1956) however, after a detailled survey of many freshwater molluscs from England and Wales has reported several green algae, including 38 unidentified forms and one known species of *Oedogonium* (*O. alternans* Wittr. et Lundell).

In course of our investigations of epizoic green algae in East Pakistan we made several collections of molluscs bearing many *Oedogonium* filaments on their shells. Out of 14 collections from two widely separated areas six species of *Oedogonium* could be identified with certainty, of which three are new taxa added to the genus.

COLLECTIONS AND ECOLOGICAL NOTES

The molluscs were collected mostly from permanent ponds and temporary ditches from different localities in two districts — Dacca and Rajshahi — separated by about 200 miles. Mostly the Oedogonia filaments were found to grow on the following : *Paludomus* sp., *Pila* sp., *Unio* sp., and on some crabs. Many of these animals bearing sterile filaments of *Oedogonium* were kept in the laboratory but we failed to get any mature or fertile stages from such filaments. In all, six species have been identified where the complete mature stages were present and about 21 vegetative forms (19 from Dacca and 2 from Rajshahi) have been left unidentified due to lack of complete stages.

It may be mentioned that most of the matured species were found in Rajshahi collections, whereas in Dacca collections mostly vegetative forms and sterile filaments with brown akinetes have

Source MNHN, P

been obtained, although these collections were made more or less at the same time of the year. In Dacca these sterile filaments were found to appear and disappear several times in a year without producing any sexual stages. The climatic conditions and limnological features of these two areas might be responsible for such variance in fertility of the *Oedogonium* plants. Average temperature is low and the rainfall is higher in Dacca District than in Rajshahi District, where as the water of the collected areas in Dacca is usually acidic and in Rajshahi areas alkaline. More detailed information on these points will be worked out in future.

As regards the occurrence of *Cladophora* spp. on the shells of several species of molluscs we have noticed that when *Cladophora* grows profusely at any particular time no *Oedogonium* spp. can been seen. Similarly, when the shells of the animals (particularly *Pila* sp.) are covered by *Oedogonium* filaments *Cladophora* filaments are lacking at that time. On the other hand, several other algae may grow together with *Oedogonium* on the same animal shell to form a complex algal community. Other algae growing with *Oedogonium* are : *Lyngbya* sp., *Bulbochaete* (2 spp.), *Ulothrix* sp., *Coleochaete* (3 spp.), *Sligeoclonium* (several forms), *Pithophora* sp. and some filamentous diatoms.

Following are the six species of *Oedogonium* described in this paper :

Monœcious : 1. *O. crispum* (Hass.) Wittr. var. *hawaiense* Nordst.
2. *O. patulum* Tiff. forma *macroporum* fa. nov.

Diœcious :

Macrandrous : 3. *O. subcardiacum* sp. nov.
4. *O. pisanum* Wittr.

Nannandrous : 5. *O. bengalense* Hirn var. *polysporum* var. nov.
6. *O. cyathigerum* Wittr. var. *macrogonium* var. nov.

1. *Oedonium crispum* (Hass.) Wittr. var. *hawaiense* Nordst.
(Tiffany, 1930, p. 114, Pl. 35, f. 320; 1937, p. 53, Pl. 22, f. 342; Gemeinhardt, 1939, p. 212; Skuja, 1949, p. 82, Pl. 15, f. 10-12).

Plant macrandrous, monœcious; oogonium 1-3, subovoid-globose, operculate, division superior; oospore globose, almost filling the oogonium, spore wall smooth; antheridium 1-3, subepigynous; sperms 2 in each antheridium, division horizontal; vegetative cells, 12-17 μ × 27-53 μ; oogonium, 35-40 μ × 33-47 μ; oospore, 31-38 μ × 35-38 μ; antheridium, 12-15 μ × 4-8 μ (Pl. 2, Figs. 4-5).

Source MNHN, Paris

2. *Oedogonium patutum* Tiffany 1937.

(TIFFANY, p. 75, Pl. 9, f. 110; GEMEINHARDT, 1939, p. 107, f. 88; *O. hirnii* Gutw. var. *africanum* West, in TIFFANY, 1930, p. 73, Pl. 14, f. 138; PRESCOTT, 1931, p. 99).

Oedogonium patutum Tiff. forma *macroporum* fa. nov.

Plant macrandrous, monœcious; oogonium 1-2, subglobose to pyriform ovoid; poriferous, pore superior, wide; oospore globose, not filling the oogonium, spore wall smooth; antheridium 1-2, subepigynous, sperms 2 in each, division horizontal; vegetative cells capitellate, 10-15 μ × 37-55 μ; oogonium, 30-38 μ × 32-45 μ; oospore, 27-33 μ × 35-38 μ; antheridium, 10 μ × 5 μ (Pl. 2, Figs. 7-8).

Holotyype : ISLAM and SARMA collection No. R-3, October 9, 1961, from a ditch situated inbetween Atrai P. S. and Mongtapara, Rajshahi; Kept in Authors' herbarium in the Botany Dept., Dacca University, Dacca.

Oedogonum patutum Tiff. forma *macroporum* fa. nov.

Oogoniis 1-2, subglobosis ad pyriformibus-oviformis; poro superiore lato apertis; oosporiis globosis, oogonia non complentibus, epispori laevi; antheridiis 1-2, subepigynis; gametis masculis binis, divisione horizontali ortis; cellulis vegetativis capitellatis, 10-15 μ latis × 37-55 μ longis; oogoniis 30-38 μ latis × 32-45 μ longis; 27-33 μ latis × 35-38 μ longis; antheridiis 10 μ latis × 5 μ longis (Pl. 2, Figs. 7-8).

3. *Oedogonium pisanum* Wittr. 1876.

(TIFFANY, 1930, p. 109, Pl. 38, f. 363-364; 1937, p. 50, Pl. 21, f. 323-324; PRESCOTT, 1931, p. 102; 1951, p. 186, Pl. 36, f. 8-9; GEMEINHARDT, 1939, p. 200, f. 216).

Plant dioecious, macrandrous; oogonium solitary, ovoid to ellipsoid, operculate, division superior; oospore ovoid to ellipsoid, almost filling the oogonum, spore wall smooth; antheridium 1-2, sperms 2 in each, division horizontal; basal cell elongate; terminal cell piliferous; vegetative cells, 5-10 μ × 10-35 μ; male vegetative cells, 5-6 μ × 16-20 μ; oogonium, 17-23 μ × 25-35 μ; oospore, 17-22 μ × 25-31 μ; antheridium, 4-6 μ × 5 μ (Pl. 1, Figs. 8-11).

The plant describer here as *O. pisanum* Wittr. closely resembles *O. epiphyticum* Trans. et Tiff.

Source MNHN Paris

4. *Oedogonium subcardiacum* sp. nov.

Plants dioecious, macrandrous; oogonium solitary, subglobose or depressed-globose (tomato-shaped), poriferous, pore supra-median, (tendency towards superior position), sometimes projected; oospore subglobose, not filling the oogonium, spore wall smooth; antheridium 1-8, sperms 2 in each, divison horizonal; female vegetative cells, 27-34 μ × 101-116 μ; oogonium, 65-81 μ × 69-79 μ; oospore, 50-72 μ × 59-66 μ; male plants vegetative cells, 16-25 μ × 55-105 μ; antheridium, 15-20 μ × 10-18 μ (Pl. 1, Figs. 5-7). Holotype : same as *O. patulum* forma *macroporum* fa. nov.; kept in hept in the authors' herbarium in the Botany Dept., Dacca University, Dacca.

Oedogonium subcardiacum sp. nov.

Dioicum, macrandrium; oogoniis singulis, subglobosis vel globosis depressis; poro supramediano (tendente ad superiorem) apertis, aliquando projecto; oosporis subglobosis, oogonia non complentibus, episporio laeve; antheridiis 1-8, gametis masculis binis, divisione horizontali ortis; cellulis vegetativis feminis 27-34 μ latis × 101-116 μ longis; oogoniis 65-81 μ latis × 67-79 μ longis; oosporiis 50-72 μ latis × 59-66 μ longis; cellulis vegetativis masculis 16-35 μ latis × 55-105 μ longis; antheridiis 15-20 μ latis × 10-18 μ longis (Pl. 1, Figs. 5-7).

This new species differs from all other known species by the characteristic shape of the oogonium with sometimes projected beak-like pore. It is nearly related to *O. cardiacum* (Hass.) Wittr. var. *pulchellum* (Hass.) Hirn in size but differs from the same in having depressed-globose oogonium of unique shape (tomato-shaped). It differs from *O. glabrum* Hallas by the shape and position of the pore and having larger oogonium and oospore.

5. *Oedogonium bengalense* Hirn var. *bengalense*.

(same as *O. bengalense* Hirn, 1900; Tiffany, 1930, p. 139, Pl. 53, f. 504, 505; Gemeinhardt, 1939, p. 279, f. 324).

Oedogonium bengalense Hirn var. *polysporum* var. nov.

Plants dioecious, nannandrous, idioandrosporous; oogonium 1-8, depressed-globose to pyriform, operculate, division median (sometimes appears to be supra-median), operculum wide; oospore depressed-globose or globose, spore wall smooth, not or nearly filling the oogonium; androsporangium 1-6; vegetative cells strongly capitellate; basal cell elongate, apical cell obtuse, mostly terminated by series of oogonia; dwarf male obovoid, unicellular, on oogonium,

Source MNHN, Paris

open by a lid with conical apex; female vegetative cells, (10)-14-23 μ × 50-122 μ; oogonium, 53-60 μ × 50-63 μ (-76 μ); oospore, 40-50 μ × 40-48 μ (some 46.5 μ × 46.5 μ); androsporangium, 15-18 μ × 12-20 μ; dwarf male, 11-15 μ × 12-15 μ (Pl. 1, Figs. 1-3).

Holotype : ISLAM & SARMA collection N° D-421, November 2, 1961, Dacca; growing on the shell of *Paludomus* sp.

Oedogonium bengalense Hirn var. *potysporum* var. nov.

Dioica, nannandra, idioandrospora; oogoniis 1-8, globosis depressis ad pyriformibus; operculo lato apertis, divisione mediano orto (aliquando evidenter supramediano); oosporis globosis-depressis vel globosis, episporio laevi, oogonia fere vel non complentibus; androsporangiis 1-6; cellulis vegetativis valde capitellatis; cellula basali elongata; cellula terminali obtusa, ab oogoniis in serie semper fere terminata; masculis pusillis oboviformis, unicellularis, in oogoniis ortis, operculo apice conica apertis; cellulis vegetativis feminis (10-)-14-23 μ latis × 50-122 μ longis; oogoniis 53-60 μ latis × 50-63 μ (76 μ) longis; oosporis 40-50 μ latis × 40-48 μ longis (aliquibus 46.5 μ × 46.5 μ); androsporangiis 15-18 μ latis × 12-20 μ longis; masculis pusillis 11-15 μ latis × 12-15 μ longis (Pl. 1, Figs. 1-3).

This variety differs from the type by usually having large number of oospores in series. The plants described here as a new variety of *O. bengalense* Hirn combine all the characters described for the following related species : *O. indicum* Hirn, *O. areschougii* Wittr., *O. brasiliense* Borge, *O. confertum* Hirn. The range of variations in the shape and size of the oogonium and in the measurements of the vegetative cells could be found in the same collection of this new variety.

6. *Oedogonium cyathigerum* Wittr. var. *macrogonium* var. nov.

Plant dioecious, nannandrous, idioandrosporous (?); oogonium 1-4, subovoid, sub-quadrangular, ellipsoid to elongate, (basal end of oogonium broader than apical end); pore superior; oospore same shape as oogonium, filling ar almost filling the oogonium; outer layer of the spore wall smooth, median layer with 16-20 longitudinal, continuous, rarely anastomising, often curved, ridges; terminal cell apiculate; dwarf male goblet-shaped, curved, on suffoltary cell; antheridium interior; vegetative cell, 21-39 μ (-45 μ) × 45-212 μ; suffoltary cell, 22-62 μ × 50-123 μ; oogonium, 45-75 μ × 78-131 μ; oospore, 51- 63 μ × 70-118 μ; dwarf male, 10-15 μ × 35-84 μ (Pl. 2, Figs. 1-3).

Source MNHN Paris

Holotype : ISLAM & SARMA collection N° R-3, October, 9, 1961. from a ditch situated in between Atrai P. S. and Mangtapara, Rajshahi; kept in the authors' herbarium in the Botany Dept., Dacca Univ., Dacca.

Oedogonium cyathigerum Wittr. var. *macrogonium* var. nov.

Dioica, nannandra, idioandrospora (?); oogoniis 1-4, suboviformis ad quadrangulare ellipsoideis ad elongatis (termino basali quam termino superiore latiore), poro superiore apertis; oosporiis forma iisdem ac oogoniis, oogonia complentibus vel fere complentibus, episporio laevi, mesosporio 16-20 lineis longitudinalibus saepe curvatis ferente; cellula terminali apiculata; masculis pusillis scyphiformis; antheridiis inferioribus; cellulis vegetativis 21-39 μ (-45 μ) latis × 45-212 μ longis; cellulis suffulciis 22-62 μ latis × 50-123 μ longis; oogoniis 45-74 μ latis × 78-131 μ longis; oosporiis 51-63 μ latis × 70-118 μ longis; masculis pusillis 10-15 μ latis × 35-84 μ longis (Pl. 2, Figs. 1-3).

This variety of *O. cyathigerum* differs from the type and all other forms ad varieties of the species in possessing largest size oogonium, oospore and the dwarf males, and the tip of the vegetative cell being apiculate. The shape of the big-sized oogonium is also different from other varieties.

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The aulhors wish lo thank Father Dr R. W. TIMM, Nolre-Dame College, Dacca, for kindly rendering the Latin descriptions for lhe new taxa described in this paper.

(*Departlnent of Botany, Dacca University, Dacca, Pakislan*).

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Source MNHN Paris

Explanations of the plates and figures.
(all are camera lucida drawings)

PLATE I

Figs. 1-3. — *Oedogonium bengalense* Hirn var. *polysporum* var. nov., all × 168 excepting basal cells (basal cell of Fig. 1, × 238; of Fig. 2, × 315); Figs. 1-2 showing oospores, dwarf males & basal cells of female plant; Fig. 3, showing androsporangia.

Fig. 4. — *Oedogonium* sp., × 240 (showing an elongated basal cell of an unidentified species).

Figs. 5-7. — *Oedogonium subcardiacum* sp. nov., × 210 (Figs. 5-6, female plant with oospores; Fig. 7, male plant with antheridia).

Figs. 8-11. — *Oedogonium pisanum* Wittr., × 240 (Fig. 8, female plant showing oospores & basal cell; Fig. 9 male with antheridia; Figs. 10-11, filaments showing terminal cells & hairs).

PLATE II

Figs. 1-3. — *Oedogonium cyathigerum* Wittr. var. *macrogonium* var. nov.; Fig. 1-2 × 143; Fig. 3 × 168.

Figs. 4-5. — *Oedogonium crispum* (Hassall) Wittr. var. *hawaiense* Nordst., Fig. 4 × 240; Fig. 5 × 315.

Fig. 6. — *Oedogonium* sp. × 210 (a monoecious macrandrous species which could not be identified due to immature oogonia).

Figs. 7-8. — *Oedogonium patulum* Tiff. forma *macroporum* fa. nov. × 315.

Source MNHN, Paris

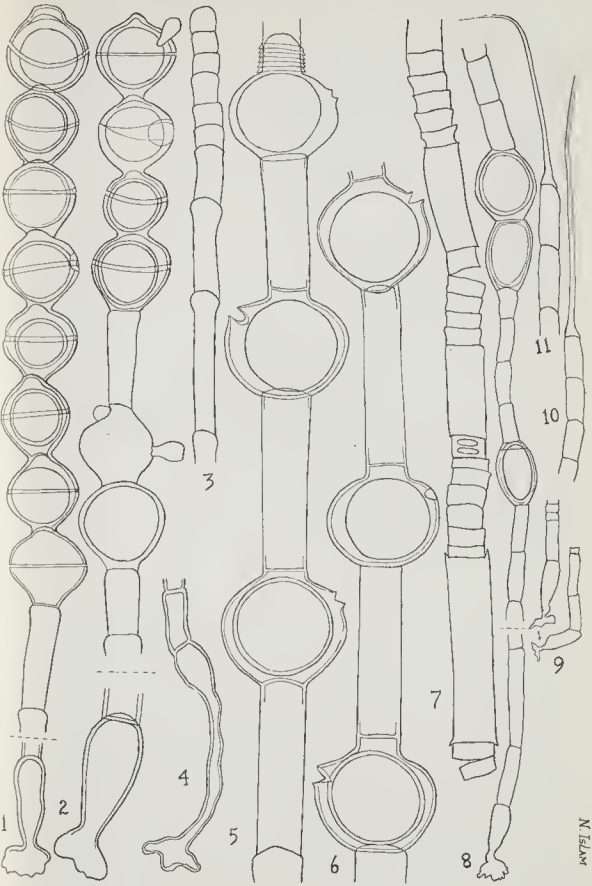

PLATE I

Source MNHN Paris

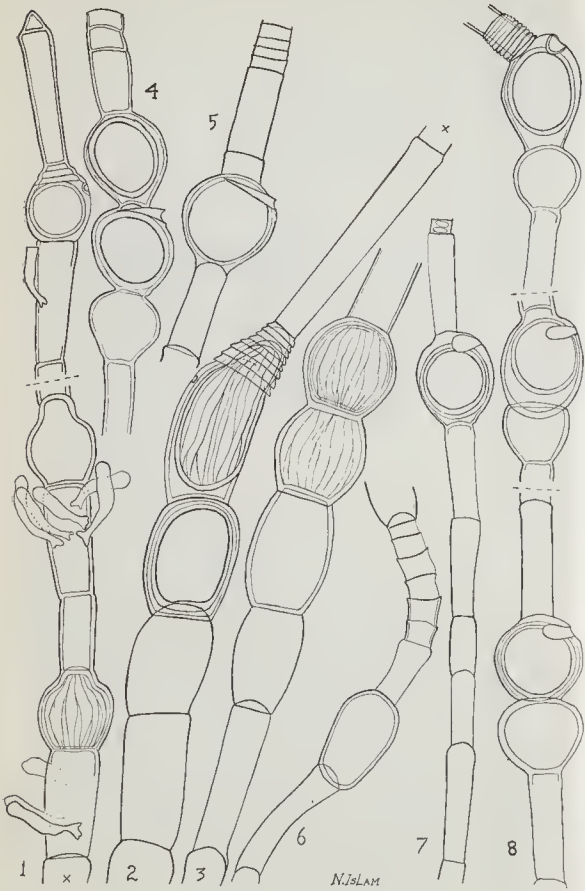

PLATE II

Source MNHN, Paris

Une nouvelle coupure générique dans la famille des Desmidiées : le genre Teilingia

Par Pierre BOURRELLY.

■

Le genre *Sphaerozosma* a été crée en 1835 par Corda pour une Desmidiée filamentense, avec une espèce: *Sphaerozosma elegans*. Dans le texte de son travail, l'auteur ne donne aucune diagnose, mais il indique, dans la légende de la Planche IV, Fig. 37 : « a) : globules qui lie les paires d'animalcules; b, b, ces animalcules individuellement réunis par la membrane intermédiaire; d, d, : gouttes huileuses avec leur contenu ».

Une « paire d'animalcules » correspond à une cellule et chaque animalcule est une hémisomate. La membrane intermédiaire qui réunit les animalcules est l'isthme, tandis que les globules sont les appendices polaires qui réunissent les cellules entre elles.

En 1840, le même auteur donne p. 205 un court chapitre sur *Sphaerozosma* et indique deux espèces. 1°) *Sph. lamelliferum* où « le membre de réunion est feuilleté, blanc ». 2°) *Sph. elegans* avec « les membres de réunion presque globuleux, petits, transparents ».

Si les descriptions de Corda sont un peu sommaires, ses figures sont bien caractéristiques.

Le type du genre : *Sp. elegans* montre de façon nette un filament unisérié constitué par des cellules en forme de *Cosmarium* avec un isthme resserré et portant à leurs deux pôles un appendice circulaire.

Il semble, sans qu'on puisse l'affirmer, que cette espèce est identique à *Sphaerozosma vertebratum* (Bréb.) Ralfs. La 2° espèce *Sph. lamelliforme* est plus difficile à identifier, et Turner la place parmi les *Spondylosium*.

En 1835, A. de Brébisson, dans son mémoire sur les « Algues des environs de Falaise », décrit un *Desmidium vertebratum* nov. sp. et donne une figure, très petite, mais qui montre un aspect voisin ou identique à celui du *Sphaerozosma elegans* de Corda.

En 1848, Ralfs dans ses « British Desmidieae », volume qui sert de point de départ pour la nomenclature de ce groupe, donne

Source MNHN Paris

une diagnose complète du genre *Sphaerozosma* en indiquant p. 65 : « Filament plane, fragile, joints closely united by means of glandular processes, and deeply divided on each side, thus forming two segments, and giving a pinnatifid appearance to the filament ». Plus loin, dans la même page 65, il précise « at the junction of the joints there are on each margin one or two minute glands or processes ».

L'espèce-type du genre, indiquée chez Ralfs par le n° 1 est *Sphaerozosma vertebratum* (de Bréb.) Ralfs. (qui est pour lui synonyme de *Sp. elegans* Corda).

A la Planche VI, Fig. 1 f et 1 g nous avons deux excellentes vues polaires des cellules, qui indiquent bien à chaque pôle de la cellule deux petits appendices filiformes, terminés par un petit globule, et disposés obliquement.

Ralfs dans le même volume élargit le genre *Sphaerozosma* car il cite comme 2e espèce : *Sph. excavatum* Ralfs en précisant que la jonction entre les cellules se fait non par 2 appendices mais par 4 granules : « the transverse view is oblong with four sessile glands, two on each side and situated near the ends » (p. 67). Ceci est bien visible à la Fig. 2 d de la Planche 6.

Enfin en 1860, Wallich décrit le nov. gen. *Onychonema* avec *O. uncinatum* comme espèce-type. Les cellules de cet *Onychonema* présentent, comme le *Sphaerozosma vertebratum* 2 appendices filiformes disposés en diagonale, à chaque pôle. Il n'y a donc aucune différence structurale importante entre les deux genres, les appendices sont seulement plus allongés chez *Onychonema* que chez *Sphaerozosma vertebratum*.

Ce fait a été signalé par Teiling (1957) et cet auteur, conclue avec raison qu'il faut supprimer le genre *Onychonema* et conserver le nom plus ancien de *Sphaerozosma*. Kützing dès 1845, avait crée un genre *Isthmosira* avec 2 espèces : *I. vertebratum* (= *Sphaerozosma vertebratum*) et *I. filiformis* (= *Onychonema filiformis*). Cette solution logique proposée par Teiling ne résout pourtant qu'une partie du Problème.

Il nous semble normal de scinder le genre *Sphaerozosma* sens. Teiling en deux genres distincts : l'un groupant les espèces à pôle cellulaire portant 2 appendices disposés en diagonale; l'autre englobant les espèces à pôle cellulaire présentant 4 granules.

Le premier groupe formera le genre : *Sphaerozosma* Corda avec *Sph. vertebratum* (Bréb.) Ralfs comme type, car la synonymie entre *Sph. elegans* Corda et *Sph. vertebratum* n'est pas établie de façon absolument sûre, tandis que la figure et la diagnose de *Sph. vertebratum* ne laisse aucune ambiguité.

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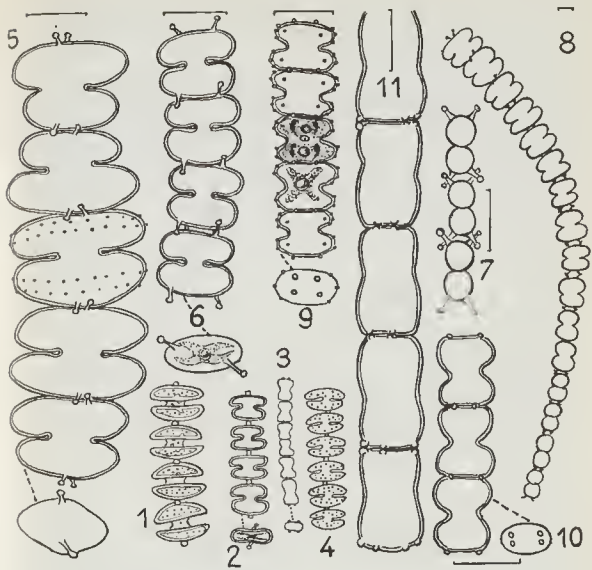

1. *Sphaerozosma elegans* Corda : Fig. 37, Pl. IV de Corda 1835.
2. *Sphaerozoma vertebratum* (de Bréb.) Ralfs, Fig. 1 C et 1 f, Pl VI de Ralfs.
3. *Sphaerozosma excavatum* Ralfs : Fig. 2 a et 2 b, Pl. VI de Ralfs.
4. Figure originale de Brébisson (collection du Laboratoire de Cryptogamie) de *Desmidium vertebratum* de Bréb. (= *Sphaerozosma vertebratum* (Bréb.) Ralfs).
5. *Sphaerozosma Aubertianum* var. *Archeri* (Gutw.) W. et G. S. W. (original de Rambouillet : quelques cellules et vue apicale : les pores représentés sur une seule cellule).

6 à 8. *Sphaerozosma filiformis* (Ehrg.) nov. comb. (original du Lac de Grand Lieu); 6 : Quelques cellules avec vue apicale et tracé du plaste; 7 : Vue de profil de 3 cellules; 8 : Un filament à plus faible grossissement montrant la torsion hélicoïdale.

9. *Teilingia granulata* (Roy et Biss) nov. comb. (original de Rambouillet : chaîne de 5 cellules avec vue apicale : les plastes sont indiqués sur 2 cellules.
10. *Teilingia excavata* (Ralfs) nov. comb. (original) 3 cellules et vue apicale.
11. Forme nouvelle de Madagascar de *Teilingia* voisin de *T. excavata*.

(Le petit trait représente 10 μ).

Source MNHN, Paris

Le second groupe constituera le nov. gen. *Teilingia* avec *T. excavata* (Ralfs) Bourrelly (= *Sphaerozosma excavatum* Ralfs.) comme espèce-type.

Le genre *Sphaerozosma* s. str. ainsi défini renfermera une partie des anciens *Sphaerozosma* s. l. et tout l'ensemble de l'ancien genre *Onychonema* avec : *O. laeve* Nordst., *O. filiformis* (Ehrbg.) Roy et Biss., *O. compactum* W. et W., *O. Nordstedtiana* Turn., *O. uncinatum* Wall., qui se nommeront : *Sphaerozosma laeve* (Nordst.) Thomasson, *Sph. filiformis* (Ehrg.) nov comb. *Sph. compactum* (W. et W.) nov. comb; *Sph. Nordstedtiana* (Turn.) nov. com., *Sph. uncinatum* (Wallisch.) nov. comb.

Le genre *Teilingia* comprendra entre autres les espèces suivantes: *Sphaerozosma excavatum* Ralfs; *Sph. bengalense* Turner; *Sph. exigum* Turn; *Sph. indicum* Turn; *Sph. quadrispinatum* Scott et Grönbl. *Sph. granulatum* Roy et Biss.; *Sph. Wallichii* Jacobs., *Sphaerozosma spinulosum* Delpt. qui prendront les noms de *Teilingia excavata* (Ralfs.) nov. comb.; *T. bengalense* (Turn.) nov. comb.; *T. exigua* (Turn.) nov. comb.; *T. indica* (Turn.) nov. comb.; *T. quadrispinata* (Scott et Grönhl.) nov. comb.; *T. granulata* (Roy et Biss) nov. comb.; *T. Wallichii* (Jacohs.) nov. comb.; *T. spinulosum* (Delp.) nov. comb.

Voici les diagnoses des deux genres :

Teilingia :

Desmidiacée à filament unisérié formé de cellules plus ou moins aplaties, à contour elliptique ou quadrangulaire, à isthme médian bien marqué. Les cellules portent à chaque pôle 4 petits granules.

Espèce type : *Teilingia excavata* (Ralfs) nov. comb. (= *Sphaerozosma excavatum* Ralfs.)

Sphaerozosma Corda *emend.*

Desmidiacées à filament unisérié formé de cellules plus ou moins aplaties, à contour elliptique ou quadrangulaire, avec ou sans épines latérales, et avec un istbme médian bien marqué. Les cellules portent à chaque pôle, 2 petits appendices disposés en diagonale en vue apicale.

Espèce type : *Sphaerozosma vertebratum* (Bréb.) Ralfs. (= *Desmidium vertebratum* Brébisson = *Sphaerozosma elegans* Corda?)

Teilingia nov. gen.

Desmidiaceae e uniseriatis filis constantae, cellulis ± complanalis, elliptico vel quadrangulo circuitu, isthmo medio bene conspicuo.

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4 minula granula singulo apice cellularum.

Species typica : T. excavata (Ralfs) nov. comb. (= Sphaerozosma excavatum Ralfs.)

Sphaerozosma Corda *emend.*

Desmidiaceae e uniseriatis filis constantae, cellulis ± complanatis, elliptico vel quadrangulo circuitu, cum vel sine lateralibus spinis, isthmo medio bene conspicuo.

Cellulae instructae singulo apice 2 appendiculis secundum diagonalem lineam a vise vertice dispositis.

Species typica : Sphaerozosma vertebratum (Bréb.) Ralfs. (= Desmidium vertebratum Brebisson = Sphaerozosma elegans Corda?).

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Outdoor mass culture of Chlorella

By A. N. KAPPANNA, F. THIVY and E. R. R. IYENGAR

■

ABSTRACT

The rates of growth of *Chlorella vulgaris* in outdoor mass culture have been studied during the months of February, March and April. The yield of dry matter per m^2 per day varies with temperature, increasing first and then falling in April. The chemical constituents and chlorophyll content of the alga have been determined.

***

Outdoor mass culture of *Chlorella* does not appear to have been experimented upon in India. The India workers have mostly confined themselves to the use of sewage water and distillery wastes as media for culturing *Chlorella* (PURUSHOTHAMAN (1), RAMAN (2), SRINIVASAN (3), BOPARDIKAR (4). The present note deals with results obtained in the work undertaken in this Institute to study (a) the rate of growth in outdoor mass culture and (b) the chemical constituents of *Chlorella* grown here.

EXPERIMENTAL

The *Chlorella vulgaris* strain isolated from a tank in the garden of CSMCRI, Bhavnagar was used for all culture experiments. In preliminary experiments (December 1961) frequent contamination by *Chlamydomonas, Scenedesmus* and Bacteria was encountered. Use of antibiotics to free bacteria from culture of *Ectocarpus confervoides* and *E. secundus* has been a success (BOALCH (5). To test this point, « Glaxo » crystaline Sodium Penicilline-G was added to the sterile culture medium to give 10,000, 5,000 and 1,000 units /ml concentrations and the cell suspension was inoculated into the media. In 10,000 and 5,000 units/ml concentrations no contamination occured. Only bacteria was controlled in the 1,000 units /ml batch, but Protozoa appeared. These precautions were not however observed in the large scale experiments described below :

400 liters of medium of the following composition, Ammonium

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Sulphate-6,0 gms., Magnesium sulphate-2,5 gms., Potassium di-hydrogen ortho Phosphate-1,25 gms., Ferric sulphate 0,005 gms., EDTA (di-sodium salt) - 0,037 gms per liter of tap water with 1 ml. of Hunter's solution containing microelements per liter of the medium, was used for the culture. The cultures were maintained outdoor in circular cement tanks which were exposed to sunlight without any obstructions. The liquid was mechanically stirred when required. The depth was maintained at 15 cms. The initial pH 6.8 was adjusted to 6.0 by the addition of some hydrochloric acid. CO_2 at 0.076 m^3 per hour was passed from a gas cylinder to the culture through a glass line, having numerous holes running along the floor of the tank.

The yield and related data are given in Table I.

TABLE I

DATA ON CHLORELLA CULTURES GROWN IN OUTDOOR

	Period of culture	Temp. of culture	pH	Average yield (dry matter)	Remarks
February, 62	20 days	19-23° C	6.2-7.2	4.5 gms/ m^2/day	No stirring was done
	20 days	19-23° C	7.2-8.8	0.375 gms/ m^2/day	d° without CO_2
March, 62	12 days	23-33° C	6.2-7.2	12.00 gms/ m^2/day	Stirring and CO_2
April, 62	12 days	29-36 5° C	6.2-6.6	9.25 gms/ m^2/day	d°

In the experiment where CO_2 was not passed, precipitation of algae on the bottom of the tank was observed, and even the pH varied markedly. The yield increased as CO_2 was supplied and slow agitation provided. It will be observed that the yield in April is lower than in March, which appears to be due to higher temperature during the month. Greater yields of 19-21 gms. /m^2/day have been reported by the Isreali workers (MAYER et al.) (6) during warmer montbs under carefully regulated conditions.

CHEMICAL COMPONENTS

The sun-dried algal material was used for estimation of mineral and other constituents noted in Table II.

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TABLE II

CHEMICAL CONSTITUENTS OF CHLORELLA

Constituents	Percentage on sundried material	Percentage on freeze-dried material (Goeghegan 1953)
Moisture	4.8	5.0
Protein	54.2	50.0
Carbohydrate	21.1	—
Total lipides	12.9	—
Ether extract	—	3.0
Ash	7.0	7.4
Phosphorous	1.40	1.1
Potassium	2.23	1.5
Magnesium	0.23	0.5
Iron	0.20	0.04
Sulphur	—	1.1
Sodium	0.112	—

The analytical figures are compared with the results of GEOGHEGAN (7).

The carbohydrate fraction was present as insoluble polysaccharide. The estimation of lipides was made by extractions with Methonal, Petroleum Ether and Ether solvent.

CHLOROPHYLL CONTENT

The chlorophyll content of the alga has been shown to vary with progress of culture (TAMIYA, et al. (8). It was therefore thought of interest to interest to determine the total chlorophyll as well as the ratio of α and β chlorophylls with progress of culture. The results are given in Table III.

Source MNHN Paris

TABLE III

CHLOROPHYLL CONTENT

Day of culture	*mg. per 100 gms. of fresh alga*			Ratio
	Total chlorophyll	α Chlorophyll	β Chlorophyll	
6th day	38.60	16.70	22.27	1 : 1.323
9th day	102.0	45.08	55.65	1 : 1.234
12th day	131.5	54.43	78.52	1 : 1.443
	mg. per 100 gms. of dry matter			
	242.0	88.0	154.0	1 : 1.1753

The results obtained substantiate TAMIYA and co-workers' observations. It will be observed that in the particular alga examined the chlorophyll-β content, at all stages, is higher than chlorophyll-α. This is quite the opposite of the finding of HASKINS (9).

The authors wish to express their thanks to Shri K. SYAMASUNDAR for the help in determining some of the chemical constituents.

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(Central Salt & Marine Chemicals Research Institute, Bhavnagar).

Source MNHN Paris

Navicula gothlandica Grunow

Par Henry GERMAIN.

■

La présente note est destinée à faire une mise au point sur une espèce vraisemblablement commune que je crois avoir signalée pour la première fois en France en 1936 (*5*, p. 135) et qui a été certainement confondue avec des espèces voisines et sans doute avec *Navicula lanceolata* (Ag.) Kütz.

Cette espèce qui, malgré l'orthographe adoptée par de nombreux auteurs, devrait, en réalité, s'écrire *gotlandica* est assez ubiquiste dans les ruisseaux, les dépôts littoraux des grands cours d'eau, les fossés et les mares susceptibles d'assèchement; elle supporte un pH. assez variable, peut être qualifiée d'euriionique (7-8,5) et souvent aussi un milieu assez riche en matières organiques d'origine animale (mares fréquentées par les bestiaux).

Elle est donnée par Hustedt (*6*, p. 296) comme un type d'eau saumâtre, par contre de Toni (*4*, p. 189) la signale avec la mention « *in aquis dulcibus gothlandiae* ».

Les stations où je l'ai rencontrée sont toutes d'eau douce et situées loin de la côte.

La morphologie est un peu variable comme l'indiquent les Figures 1 à 8 de la Planche 1 où l'on peut observer tous les passages entre les plus grandes formes (60 μ) et les plus petites (28 μ) avec des variations, d'une part, sur l'étirement des extrémités qui est en général d'autant plus sensible que la taille est plus grande, Cf. Hustedt (*5*, p. 296) et, d'autre part, sur la disposition des stries de l'area central arrondi qui sont parfois très régulières et d'autres fois alternativement courtes et longues au point que ce caractère typique de *Nav. salinarum* Grun. a pu faire appliquer cette dénomination à certaines formes que j'ai figurées dans ma thèse (*5*, Pl. X, Fig. 4) reproduites sous ce nom par Astrid Cleve Euler dans son ouvrage de 1953 (*3*, T. III, Fig. 820 c.-d.). Il n'est pourtant pas possible de les séparer les unes des autres à cause de ce caractère puisque, comme on peut le constater sur plusieurs individus de la Planche 1 (Fig. 2-4) il arrive que sur un même frustule l'area central ait des stries régulières sur un côté et inégales sur l'autre.

Source : MNHN, Paris

Les stries, comme on peut le constater, se résolvent nettement en points d'une façon sensiblement égale sur tous les individus de quelque taille qu'ils soient.

Les représentants de cette espèce rencontrés dans la région sont, à mon avis, indiscutables; ils correspondent sensiblement, comme dimensions aux données d'HUSTEDT (*6*) et d'Astrid CLEVE EULER (*3*) ainsi qu'aux Figures 33 et 34 de l'Atlas de SCHMIDT, Pl. 272, assez médiocres d'ailleurs. Le seul caractère litigieux concernerait les stries des extrémités qu'HUSTEDT donne comme convergentes mais qui, d'après Astrid CLEVE EULER (*3*, T. III, p. 158), sont parallèles ou à peine convergentes ce qui correspond exactement à mes types : le nombre de ces stries concorde avec celui donné par ce dernier auteur 12-14 en 10 μ au centre.

La détermination que j'en ai faite dans mon mémoire de 1936 (*5*) a d'ailleurs été suivie par Astrid CLEVE EULER et ma propre figure reproduite (*3*, T. III, Fig. 819 b) sous ce nom, ce que je considère comme une confirmation valable.

Caractères différentiels avec les espèces voisines.

Navicula salinarum Grun. (Pl. 2, Fig. 5) est nettement différente, malgré l'assimilation faite par Astrid CLEVE EULER. Espèce considérée comme organisme halophile, elle est d'ailleurs très rare dans notre région où je l'ai pourtant rencontrée dans un fossé à eau temporaire en avril 1941, le long d'une route aux abords d'Angers. Les stries très nettement alternativement courtes et longues ne se résolvent pas en points comme dans *Nav. gothlandica;* elle est nettement plus large et plus nettement capitée.

Navicula cryptocephala Kütz. Cette espèce si commune et si polymorphe est incontestablement proche de *Navicula gothlandica*, comme le mentionne d'ailleurs VAN HEURCK (*12*, Pl. 8, Fig. 8); toutefois, les stries plus sériées (16 en 10 μ) ne se résolvent jamais en points par les moyens d'observation optiques, même de bonne qualité.

Le type de l'espèce est, à mon avis, celui qui est représenté Pl. 2, Fig. 1 qui montre que là aussi la disposition des stries entourant l'area central peut varier comme dans *Nav. gothlandica*.

La variété *veneta* (Kütz) Grun. (Pl. 3, Fig. 3) à stries nettement radiantes au centre est souvent mêlée à une autre forme à stries parallèles que certains auteurs rapportent à *Navicula gregaria* Donkin qui a été classée (HUSTEDT, *6*, p. 269, Fig. 437) dans le groupe des *Orthostichae* mais que ce dernier ne semble pas avoir

Source MNHN, Paris

conservé dans ce groupe si l'on s'en réfère au récent fascicule du Rabenhorst Kryptogamen flora (7). Elle se distingue assez nettement de *Nav. cryptocephala* Kütz. par ses stries nettement parallèles se résolvant en fines stries longitudinales (Pl. 3, Fig. 1). C'est d'ailleurs la forme de beaucoup la plus commune dans la région où elle constitue des populations souvent très abondantes et presque pures.

La variété *lancettula* Schumann est moins fréquente; j'en ai représenté deux formes (Pl. 2, Fig. 2). La forme la plus large provient d'un rocher suintant qui semble le type de station caractéristique de cette variété. Elle se trouve pourtant aussi dans les dépôts littoraux de nos rivières, c'est le cas de la forme la plus étroite (dépôt littoral de la Sarthe).

La variété *intermedia* Grun. (Pl. 2, Fig. 3) est remarquablement fixe, comme je l'ai fait remarquer (*5*, p. 134), elle se distingue nettement de l'espèce par sa taille, sa strie médiane nettement plus longue et l'on ne trouve aucune forme de passage avec le type. Elle est assez commune, mais toujours clairsemée au milieu d'autres espèces, en particulier, dans les ruisseaux de la région n'asséchent pas. Elle devrait, comme je l'ai déjà dit, constituer une espèce indépendante.

Navicula simplex Krasske (Pl. 2, Fig. 6) est aussi nettement différente de *Nav. gothlandica*; si la figure d'Hustedt (*6*, p. 296, Fig. 500) s'en rapproche, et qui est, à mon avis, peu conforme, par contre celle qu'il a représentée dans son ouvrage sur le parc Albert (*9*, Pl. V, Fig. 6-7) ainsi que dans l'Atlas de Schmidt (*11*, Pl. 272, Fig. 33-34) sont très caractéristiques, elles correspondent parfaitement à celle que je représente ici et seraient, à mon avis, plutôt à rattacher au groupe des *Orthostichae*, près de *N. halophila*.

Navicula rhynchocephala Kütz. ne peut être confondue avec *N. gothlandica*, si l'on en juge par les trois formes représentées (Pl. 4, Fig. 6-7-8). La figure d'Hustedt (*6*, Fig. 501) qui n'est aucunement capitée ne correspond à aucune des formes rencontrées dans l'Ouest et pourrait, jusqu'à un certain point, prêter à confusion surtout qu'elle est notée comme « une des diatomées les plus communes », ce qui n'est pas du tout le cas dans notre région, elle s'appliquerait mieux jusqu'à un certain point à *Nav. gothlandica*, mais le nombre des stries et la ponctuation très accentuée ne peut, à mon avis, donner lieu à discussion.

Navicula gothlandica se distingue aussi de *Navicula lanceolata* (Ag.) Kütz. représentée (Pl. 4, Fig. 1 et 2) ainsi que de la variété

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Cymbula (Donkin) Cl. (Pl. 4, Fig. 3 et 4) et dont le caractère principal est de présenter des stries toutes radiantes. Il est pourtant vraisemblable que c'est avec cette espèce que la confusion a été la plus fréquente, car si l'on se réfère au Synopsis de Van Heurck (*12*, Pl. 8, Fig. 16-17) on peut se rendre compte que ces figures sont presque superposables avec certaines formes de la Planche 1 ci-après. Cet ouvrage faisant incontestablement autorité, il est certain que beaucoup de diatomistes ont du attribuer à *N. lanceolata* des formes qui auraient du l'être à *N. gothlandica*. Ceci vient tout à fait en concordance avec l'opinion d'Hustedt (*8*, p. 630) qui estime que les formes de *Nav. gothlandica* assez élancées passent insensiblement à *Navicula phyllepta* Kütz. figurée dans la même planche de Van Heurck (Fig. 40) laquelle est rattachée aussi à *Navicula lanceolata* (Ag.) Kütz. Il ne faut donc pas s'étonner de la confusion au sujet de cette espèce et je crois que la Planche 8 de Van Heurck y est pour beaucoup.

Enfin, pour essayer de trancher la question j'ai eu la curiosité de remonter aux sources qui sont très vagues quant aux descriptions et aux figures de l'espèce de Grunow, en particulier, le synopsis de Cleve (2, D. II S. 14) et plus spécialement la préparation n° 161 de la collection Cleve et Moller que j'ai pu consulter au Muséum de Paris; or, quel ne fut pas mon étonnement en constatant que la seule forme qui, dans cette préparation, pouvait correspondre à *Nav. gothlandica* était en réalité, une forme que j'avais trouvée une fois dans notre région (Etang du Bellay près de Saumur) et que j'avais ramenée à *Navicula helvetica* Brun (Pl. 4, Fig. 7), espèce très différente de *N. cryptocephala*, s'écartant nettement du groupe des *lineolatae* et se rangeant dans celui des *orthostichae*. Bien que cette forme ait une taille plus faible et un nombre de stries plus élevé que l'espèce de Brun, elle correspond exactement à la forme signalée par Hustedt (*10*, p. 349, Pl. 37, Fig. 13), à tous points de vue, y compris l'asymétrie de l'area central qui est un des éléments les plus typiques de l'espèce. Il est d'ailleurs remarquable que cette espèce peu commune se trouve associée dans la préparation 161 de Cleve et Moller avec un certain nombre d'autres telles que : *Nav. radiosa* Kütz. — *Nav. Tuscula* (Ehr.) Grun. — *Cymbella Ehrenbergii* Kütz. — *Cymbella helvetica* Kütz. — *Mastogloia dansei* W. Sm. — *Nav. lanceolata* (Ag.) Kütz. — *Nav. Cymbula* (Donkin) Cl. qui ne sont pas tellement répandues et qui se trouvent également associées avec elle dans la station angevine précitée.

Je pense que cette interprétation de Cleve et Moller vient de ce que leur préparation est montée dans un milieu peu réfregent

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LÉGENDE DES PLANCHES

Planche I (1) (Pl. 10)

Fig. 1 à 8. — *Navicula gothlandica*

Planche II (1) (Pl. 11)

Fig. 1. — *Navicula cryptocephala*
Fig. 2. — — — var. *lancettula*
Fig. 3. — — — var. *intermedia*
Fig. 4. — — *gregaria*
Fig. 5. — — *salinarum*
Fig. 6. — — *simplex*
Fig. 7. — — *helvetica*

Planche III (1) (Pl. 12)

Fig. 1. — *Navicula gregaria*
Fig. 2. — — — forme courte
Fig. 3. — — *cryptocephala var. veneta*
Fig. 4. — — *viridula*
Fig. 5. — — *Atomus*
Fig. 6. — *Caloneis Bacillum*

Planche IV (1) (Pl. 13)

Fig. 1-2. — *Navicula lanceolata*
Fig. 3-4. — — — var. *cymbula*
Fig. 5. — — *subrhynchocephala*
Fig. 6. — — *rhynchocephala* var. *genuina* Mayer
Fig. 7. — — — var. *rhynchocephala*
Fig. 8. — — — var. *elongata* Mayer

(1) Grossissement × 1 800

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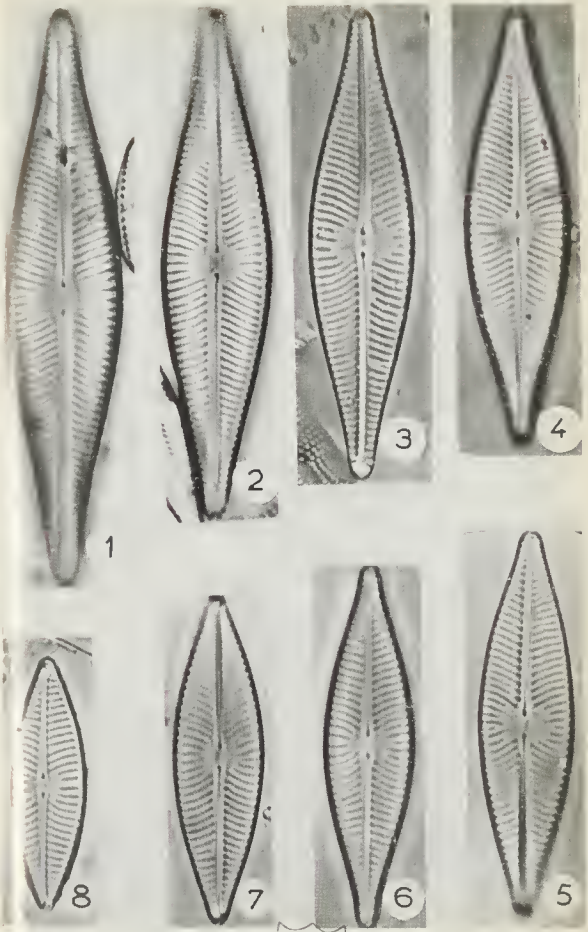
NAVICULA. PL. I.



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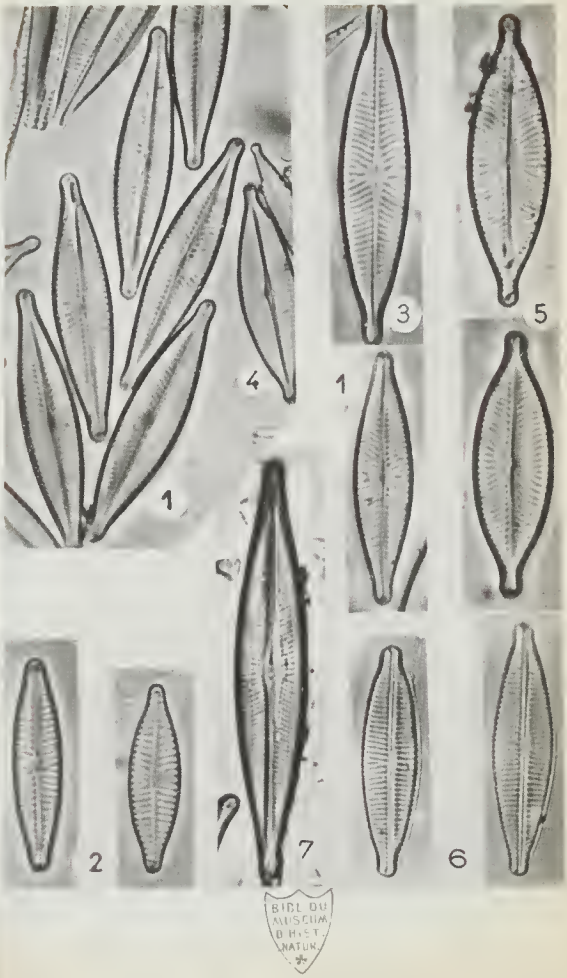
NAVICULA. Pl. II.



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NAVICULA. PL. III.

BIBL DU MUSEUM D'HIST NATUR

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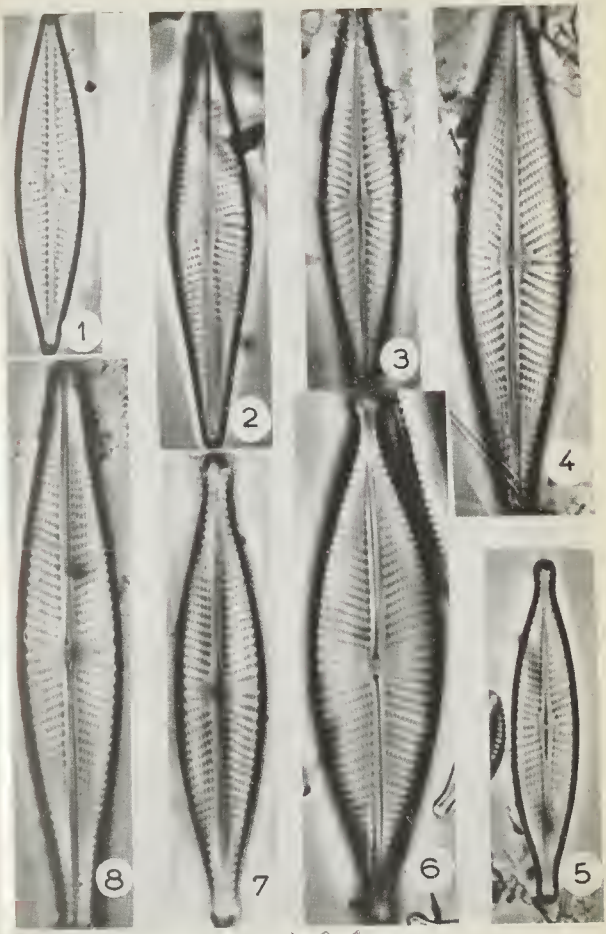
NAVICULA. Pl. IV.



BIBL. DU MUSEUM D'HIST. NATUR.

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dans lequel les stries se résolvent mal en points et les stries longitudinales sont très peu apparentes, mais un examen avec un bon objectif à immersion et un éclairage bien manié permet d'affirmer qu'il s'agit de *Navicula helvetica* Brun. Cette confrontation ne peut donc pas me faire changer d'opinion; les formes représentées sur la Planche 1 doivent être attribuées à *Navicula gothlandica* Grunow.

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Source MNHN Paris

NOTULES ALGOLOGIQUES

Cette rubrique réunit de courtes notes sans illustrations ni références bibliographiques. Elle permettra aux auteurs de publier des observations nouvelles ne se prêtant pas à un long développement, notamment celles concernant l'écologie ou la biogéographie des Algues, ou de prendre date avant la parution d'un travail plus complet.

■

Sur la taxinomie de *Navicula Lagerstedtii* Cleve.

Faisant suite à plusieurs discussions sur cette question, le mémoire de KOLBE : (Zur Taxonomie von *Navicula lagerstedtii* Cl., *Sv. Bot. Tidskr., 53,* 1959) a fait l'historique de cette question sans toutefois tirer de conclusions.

Or, si l'on s'en tient objectivement et rigoureusement aux dessins et diagnoses des auteurs, c'est-à-dire sans formuler des hypothèses incontrolables actuellement, deux remarques s'imposent :

1° *Nav. Lagerstedti* Cl. (HUSTEDT, 1934, in Atlas der Diatomaceen kunde, Pl. 400, Fig. 33-37. *Aschersleben-Leipzig-Berlin*, 1874-1959) n'a rien de commun, si ce n'est le contour, avec *Nav. Lagerstedtii* Cl. (CLEVE. P.T., 1894-Synopsis of the Naviculoid Diatoms. 1. — *Kongl. Sv. Vet.-Akad. Handl. 26-1. Stockholm*) reprise de *Nav. species* (LAGERSTEDT 1873 — Sötvattens-diatomacéer fran Spetsbergen och Beeren Ailand *Bih. K. Sv. Vet.-Akad. Handl. 14-1. Stockholm*). La figure de LAGERSTEDT (absence d'anneaux terminaux, stries médianes surécartées et non marginales) ne peut être confondue avec celle d'HUSTEDT (présence d'anneaux terminaux, stries médianes marginales). Rien ne permet de suspecter a priori l'exactitude de la figure de LAGERSTEDT; l'objectivité commande de la prendre telle qu'elle est.

2° Pour LUND (1946 : Observations on Soil Algae. 2. *New. Phytologist. Vol. 41-1. London*) le *Nav. Lagerstedti* d'HUSTEDT (ci-dessus) ne serait pas autre chose que *Nav. ignota* Krasske (KRASSKE, 1932 : Beitrage zur Kenntnis der Diatomeenflora der Alpen. *Hedwigia, Bd. 79. Dresden*). Si les deux figures de cet auteur (Pl. III, Fig. 19) sont bien conformes à celles d'HUSTEDT comme contour et striation, elles ne présentent aucune interruption terminale des stries; tout au plus pourrait-on supposer que, dans la première figure, l'écourtement notable des toutes dernières stries dénote que la forme observée par KRASSKE présentait bien l'interruption annulaire en question, mal vue ou négligée dans l'exécution du dessin.

Source : MNHN, Paris

Or, cette hypothèse, toute gratuite, se trouve ruinée par KRASSKE lui-même (KRASSKE, 1943 : Zur Diatomeen Lapplands. *Berucksichtigung deutsch bot. Gesellschaft, 61*) qui figure une var. *palustris*, avec les anneaux caractéristiques, qu'il rattache à l'espèce *Lagerstedtii*. Si, en effet, à la suite de la publication de *N. Lagerstedti* par HUSTEDT en 1934 (espèce évoquant *N. ignota* Kr. mais possédant les anneaux terminaux) KRASSKE avait vérifié la présence d'anneaux sur son exemplaire, il aurait, par priorité, rattaché sa variété *palustris* de 1943 à son espèce *ignota* de 1932.

Quoi qu'il en soit, nous sommes en présence de la publication de trois figures différentes et, tant que les hypothèses émises par divers auteurs n'auront pas été vérifiées, il semble rationnel, pour éviter toute confusion, d'adopter les espèces suivantes :

Nav. Lagerstedtii Cleve (1894)
(stries médianes surécartées, sans anneaux).

Nav. ignota Krasske (1932)
(stries médianes écourtées simulant pseudo-stauros, sans anneaux).

Nav. Lagerstedtii Hustedt (nec Cleve) (1934)
(stries médianes comme ci-dessus, avec anneaux terminaux).

R. MAILLARD.

Source MNHN Paris

BIBLIOGRAPHIE

Les conditions actuelles de l'imprimerie ne permettant plus d'envisager la parution d'une Bibliographie Algologique méthodique comme dans la première série de cette revue, il ne sera publié que des indications bibliographiques concernant les ouvrages importants ou les mémoires d'intérêt général. Les lecteurs de langue française peuvent trouver un complément d'information dans la « Bibliographie » paraissant en annexe au « Bulletin de la Société botanique de France » et dans le « Bulletin analytique » publié par le Centre National de la Recherche Scientifique.

■

BECK S. — Licht und elektronenmikroskopische Untersuchungen an einer sporenbildenden Cyanophycee aus dem Formenkreis von *Pleurocapsa fuliginosa* Hauck. — *Flora*, **153**, 1963.

Le protoplasme de cette Cyanophycée marine présente une membrane à double contour. L'appareil nucléaire est dispersé dans le cytoplasme. Lors de la formation des endospores, chaque unité nucléaire s'entoure d'un système de lamelles plastidiales parfaitement concentriques. Les spores montrent une membrane même lorsqu'elles sont encore contenues dans le sporange.

P. BY.

BELCHER J. H. and SWALE E. M. F. — Some new and uncommon British Volvocales. — *British Phycol. Bul.*, **2**, **2**, 1961.

Les auteurs signalent et décrivent des Volvocales rarement observées des genres : *Pyramimonas, Pedinomonas, Spermatozopsis, Monomastix, Lobomonas, Diplostauron, Phacotus.*

Ils décrivent le nov. genr. *Myochloris*, espèce à 2 fouets inégaux à insertion ventrale.

P. BY.

CHAPMANN V. J. — The marine algae of Jamaica. Part. 2. Phaeophyceae and Rhodophyceae. — *Bull. Inst. of Jamaica*, **12**, **2**, p. 201, 1963.

Ce travail est la suite d'un premier fascicule paru en 1961 sur les Cyanophycées et les Chlorophycées.

L'auteur signale pour la Jamaïque une cinquantaine de Phéophycées et plus de 150 Rhodophycées.

Les figures sont presque toutes extraites de publications antérieures.

Un grand nombre d'espèces sont signalées pour la première fois à la Jamaïque, de plus quelques espèces nouvelles des genres *Ectocarpus, Acrochaetium*, et *Herposiphonia* sont décrites et figurées.

M. DZ.

Source : MNHN, P

CHRISTEN H. R. — Zur Taxonomie der Farblosen Eugleninen. *Nov. Hedwigia*, **4**, **3** + **4**, 1962

L'auteur donne une synthèse originale de la taxinomie et de la Phylogènie des Euglèniens incolores. Au cours de son travail, il décrit 2 nov. genres : le genre *Parmidium*, voisin des *Phacus* incolores et le genre *Pseudoperanema* pour les *Peranema* à 2 fouets; le genre *Peranema* est réservé aux formes à fouet unique.

De nombreuses espèces nouvelles des genres *Menoidium*, *Rhabdomonas*, *Calycimonas*, *Petalomonas*, *Notosolenus*, *Dinema* sont décrites et figurés.

L'auteur reprend la systématique de tous les Euglèniens en précisant les limites de chaque genre. Il reconnaît les 2 ordres des *Euglenales* et des *Peranemales*. Dans les *Euglenales* nous trouvons 3 familles : *Euglenaceae*, *Astasiaceae* et *Colaciaceae*. Les *Peranemales* sont divisées en *Peranemaceae*, *Petalomonadaceae* et *Anisonemaceae*. Remarquons que d'après SILVA (*Taxon*, 9, 1, 1960, non cité par CHRISTEN) le genre *Dinema* Perty doit prendre le nom de *Dinematomonas* Silva (il existe une Orchidée et un Coleoptère du nom de *Dinema*).

Ce travail excellent est une mise au point très précise d'un grand intérêt.

P. BOURRELLY.

CHRISTENSEN T. — Palmella formation in *Radiofilum transversale* (Bréb.) nov. comb. — *Flora*, **152**, 1962.

L'auteur observe en culture des formations palmelloïdes chez l'*Hormospora transversalis* de Bréb. Il montre que cette algue est identique au *Radiofilum irregulare* (Wille) Brunn. Le nom correct est donc *Radiofilum transversale* (Breb.) Christ.

P. BY.

CLAUS G. — Data on the ecology of the Algae of Peace cave in Hungary. — *Nov. Hedwigia*, **4**, **1/2**, 1962.

L'auteur poursuit ses travaux de floristique et d'écologie sur les grottes de Hongrie.

Les cultures faites à partie de matériel recueilli dans une grotte à l'obscurité totale, à température constante (environ 10°) et très forte humidité (98-100 %) sont très riches en espèces : 68 Cyanophycées, 2 Euglènophytes, 4 Chrysophycées, 4 Diatomées, 11 Chlorophycées et une Rhodophycée. Description d'espèces nouvelles d'algues bleues des genres : *Fortiea* (1), *Pseudanabaena*, *Phormidium*, *Lyngbya* et *Palikiella*.

P. BY.

DANGEARD P. — Sur le développement de *Punctaria latifolia* Gréville récolté dans le Bassin d'Arcachon. — *Le Botaniste*, **46**, pp. 205-224.

Les zoospores des sporocystes pluriloculaires donnent naissance à des pléthysmothalles porteurs de sporocytes et de plantules, elles-mêmes

(1) Et non *Fortiella* comme l'indique par erreur le texte.

Source MNHN Paris

fertiles; des zoospores issues des sporocystes uniloculaires germent directement en plethysmothalles identiques aux précédents ce qui remet en question les cycles possibles de cette espèce.

M. Dz.

Dangeard P. — Biologie et Sexualité de quelques *Ulva*. — *Le Botaniste*, 46, pp. 181-204, 1963.

Remarques sur quelques *Ulva* françaises et marocaines. Possibilité de coputation entre *Ulva lactuca* et *Ulva rigida* et discussion sur la valeur de cette dernière espèce. Description d'une variété nouvelle du Maroc (*Ulva linearis* var. *lata*).

M. Dz.

Dawson E. Y. — Marine red algae of Pacific Mexico VI. — *Nova Hedwigia*, 5, pp. 431-476, 19 pl., 1963.

Suite des travaux précédents : *Leptofauchea auricularis* nov. sp., *Maripelta* nov. genr., *Maripelta thivyae* nov. sp., *Botryocladia adhaerens* nov. sp., *B. guaymasensis* nov. sp. sont décrites et figurées.

M. Dz.

Ercegovic A. — Contribution à la connaissance de certains genres d'Algues rouges en Adriatique. — *Act. Adriatica, Split*, 10, 5, 1963.

L'auteur étudie certaines Rhodophycées qui étaient encore inconnues de l'Adriatique.

Les genres *Bonnemaisonia, Thuretella, Halymenia, Calosiphonia, Nemastoma, Platoma, Rhodymenia* sont passées en revue.

L'auteur décrit quelques taxa nouveaux et donnent des précisions morphologiques, cytologiques, écologiques sur ces algues. Il décrit enfin enfin le nov. gen. *Pterocladiopsis* dont la place systématique reste incertaine, car il n'a pas pu observer d'organes reproducteurs.

P. By.

Ettl H. — Uber zwei *Sphaerellopsis*-Arten. — *Nov. Hedwigia*, 5, 1963.

L'auteur précise les caractères qui séparent *Sphaerellopsis* de *Chlamydomonas* et propose 4 nov. comb. pour des espèces rangées autrefois dans les *Chlamydomonas*.

P. By.

Geitler. — Inäquale Teilungen von Chromatophoren und die ersten Teilungen des Keimlings von *Coleochaete scutata*. — *Planta*, 58, 1962.

— — Entwicklungsgeschichtliche Untersuchungen an *Coleochaete* Arten. — *Osterr. Bot. Zeilschr.*, 109, 4/5, 1962.

Source MNHN

— — Die Entwicklungsgeschichte von *Coleochale nitellarum* und das Rechts-Links Problems. — *Ibid.*

L'auteur continue ses travaux de morphologie sur les *Coleochaete*. Il étudie avec beaucoup de précision les premiers stades de développement lors de la germination des zoospores végétatives ainsi que la formation des spermaties. Dans les nombreuses espèces observées, germination et formation des spermaties présentent toujours une division inégale de la cellule et du plaste. L'auteur étudie aussi la formation des poils engainés lors de la germination des jeunes thalles.

P. By.

Gerloff J. — Beiträge zur Kenntnis einiger Volvocales II. — *Nov. Hedwigia*, 4, 1/2, 1962.

L'auteur ressuscite le genre *Chloromonas* pour les *Chlamydomonas* sans pyrénoïde. Il considère avec juste raison que ce caractère, qui est d'une constance remarquable, justifie une coupure générique.

Il décrit ensuite quelques nov. sp. de *Chloromonas* et de *Chlamydomonas*. Signalons la découverte d'un *Chlamydomonas* à 4 vacuoles contractiles apicales.

L'auteur précise la description de *Polyblepharides singularis* Dangeard., espèce à 8 fouets, sans cratère flagellaire, fort rarement signalée.

P. By.

Hillard D. K. et Asmund B. — Studies on Chrysophyceae from some Ponds and Lakes in Alaska II. — *Hydrobiologia*, 22, 3-4, 1963.

Ce remarquable travail consacré aux genres *Dinobryon*, *Hyalobryon*, et *Epipyxis* résoud enfin, grâce au microscope électronique, la question des limites des trois genres cités.

Les auteurs démontrent que les *Hyalobryon* ont une logette composée d'écailles elliptiques imbriquées. Cette structure, identique à celle que l'on observe chez les *Epipyxis*, permet de supprimer le genre *Hyalobryon*. Ne restent donc que les genres *Epipyxis* à logettes écailleuses et les *Dinobryon* à logettes sans écaille. C'est là une conclusion parfaitement logique.

Les auteurs décrivent de ce fait toute une série de nov. comb. ainsi que 12 nov. sp. d'*Epipyxis* et 2 nov. sp. de *Dinobryon*. Nous regrettons seulement qu'ils ne donnent pas de clef de détermination du genre *Epipyxis*.

P. By.

Van den Hoek C. — Sur la synonymie de trois Ulves d'eau saumâtre : *Ulva curvata, U. dangeardii et U. incurvata*. — *Phycologia*, 2, 4, 1963.

L'auteur montre que *Ulva incurvata* Parriaud, et *Ulva Dangeardii* Gayral et S. de Mazancourt sont des synonymes de l'*Ulva curvata* (Ktz.) de Tani, décrite en 1845 par Kützing sous le nom de *Phycoseris curvata*.

Source MNHN, Paris

L'auteur donne des photographies du type et des dessins du thalle en coupe et en vue de surface.

P. By.

Van der Hoek C. — Revision of the European species of *Cladophora*. — *Thèse Univ. Leiden*, 1963.

Quelques mois après le mémoire de Soderström sur les *Cladophora* de l'Atlantique Nord, voici une monographie sur l'ensemble des *Cladophora* d'Europe. Ce travail est un volume de 248 pages complété par 55 planches. Nous avions 15 espèces pour l'Atlantique Nord, chez Soderström nous arrivons ici à 34 espèces retenues (38 taxa avec les variétés).

Après une courte introduction de 27 pages de généralité, morphologie, cytologie, reproduction, cultures, écologie, distribution, l'auteur étudie avec une grande précision les 38 taxa européens : 27 taxa sont marins et 11 d'eau douce.

Le genre tel que le définit l'auteur englobe les genres *Basicladia*, *Rama* et *Aegagropila*. Il divise le genre en 11 sections : *Affines*, *Chamaelhammnion*, *Basicladia*, *Repentes*, *Aegagropila*, *Boodleoides*, *Cornuta*, *Rupestres*, *Cladophora*, *Glomeratae*, *Longiarticulatae*. La définition des espèces est fondée sur l'étude du type d'herbier. L'auteur a fait de nombreux séjours à l'étranger pour examiner un nombre considérable d'échantillons d'herbier. Cela l'a conduit, hélas, à remanier la synonymie : ainsi les 15 espèces du mémoire de Soderström se retrouvent dans le présent ouvrage sous des noms différents. Par exemple la synonymie de *Cladophora fracta* v. *fracta* occupe plus de 3 pages; celle de *Cl. sericea* 2 pages. D'un autre côté, l'auteur n'a pas multiplié les taxa, bien au contraire, ainsi le genre *Aegagropila* sect. *Aegagropila* renferme 6 espèces dans Brand : l'auteur lui n'admet que la seule espèce *Cladophora aegagropila*. Ainsi définie l'espèce renferme à la fois des thalles en boules, des thalles en coussinets et des thalles gazonnants ce qui est peut-être difficile à admettre. Malgré une clef de détermination bien faite, des descriptions très précises et de nombreux et excellents dessins, il semble, pour un profane, que la détermination des *Cladophora* reste souvent difficile. Il faut pourtant remercier l'auteur chaleureusement de nous apporter les fruits de son expérience et de faciliter ainsi la tâche des algologues.

P. Bourrelly.

Nurul Islam A. K. M. — A revision of the genus *Stigeoclonium*. — *Beith. z. Nova. Hedwigia*, 10, 164 p.; 47 pl., 1963.

L'auteur donne une monographie très complète du genre *Stigeoclonium*, fondée sur l'étude du matériel des grands herbiers mondiaux et des algues récoltées par lui-même.

Une quarantaine de pages sont consacrées aux généralités : historique, morphologie, zoospores, gamètes, zygote, stade palmelloïde, formation des ramifications, cultures, écologie, distribution géographique, association. Puis l'auteur précise les limites du genre en montrant les caractères des genres voisins : *Cloniophora* et *Draparnaldia*. La page 50 nous donne la clef de détermination des 28 espèces reconnues dans le genre. Parmi ces espèces signalons 3 espèces nouvelles. Pour chaque espèce

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nous trouverons : la bibliographie et l'iconographie, puis la synonymie. Enfin une description très précise, l'indication du type, des remarques critiques et la longue liste des échantillons examinés, classés par région. Une excellente illustration de 47 planches originales complète le volume.

Une liste terminale des 73 espèces connues de *Stigeoclonium* est accompagné de commentaires justifiant la synonymie ou le rejet de certaines espèces.

Le genre est divisé en 3 groupes, afin de permettre une détermination plus aisée des espèces : le 1er groupe renferme les espèces dont les axes et les branches primaires sont morphologiquement identiques, les cellules sont toutes de même forme.

Dans le 3e groupe sont les espèces où l'axe présente deux types de cellules : cellules courtes produisant les ramifications, cellules allongées sans ramification.

Dans le 2e groupe se trouvent les formes intermédiaires entre les groupes 1 et 3, où se montrent déjà une légère différenciation des cellules de l'axe. 11 pages de bibliographie, un index alphabétique des genres et espèces terminent le travail.

Nous avons là, un travail très précis, très consciencieux qui fait honneur à son auteur, et rendra service à tous les algologues en rendant possible (sinon facile) la détermination des *Stigeoclonium*.

P. Bourrelly.

Javornicky P. — Two scarcely known genera of the class Dinophyceae : *Bernardinium* Chod. and *Crypthecodinium* Biechl. — *Preslia*, 34, 1962.

L'auteur montre que le genre *Bernardinium* diffère d'*Hemidinium* par l'absence de tabulation de la membrane. De ce fait 2 espèces d'*Hemidinium* sont versées dans le genre *Bernardinium*.

Les cultures montrent que le *Crypthecodinium setense* Biechl. est identique à *Glenodinium Cohnii* Seligo. Cette espèce doit donc prendre le nom de *Crypthecodinium Cohnii* (Seligo) nov. comb. Il s'agit d'une *Dinococcale* dont les zoospores, à tabulation visible seulement après imprégnation argentique, rappellent les *Gyrodinium*.

P. By.

Jonsson S. — Recherches sur les Cladophoracées marines (structure, reproduction, cycles comparés, conséquences systématiques). *Ann. Sc. Nat. Botanique*, 12e sér., 3, 1, 2, pp. 25-230, 48 fig., 16 pl., 1962.

L'auteur fait avec soin, et précision, une étude comparée des principaux genres de Cladophoracées marines, et s'attache surtout à la morphologie, à la cytologie et à la reproduction chez *Acrosiphonia* et *Spongomorpha*.

Chez les formes ramifiées, la ramification se fait toujours par bourgeonnement d'une cellule intercalaire. Par contre le mode d'insertion des rameaux se produit avec (chez *Cladophora*) ou sans évection (*Acrosiphonia, Spongomorpha*). Les rameaux sont à croissance illimitée grâce

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à l'action de cellules intercalaires ou apicales. Chez *Acrosiphonia spinescens*, certains rameaux ont uniquement une croissance intercalaire ce qui explique la présence de formes en crochet.

L'ancrage du thalle se fait par rhizoïdes pluricellulaires (*Spongomorpha, Acrosiphonia*) ou unicellulaires (*Cladophora, Urospora*).

Il y a deux types de développement : 1°) chez *Acrosiphonia spinescens* et *Spongomorpha lanosa*, l'embryospore donne soit un filament pluricellulaire rampant, soit un massif discoïde rampant, puis des filaments dressés, simples et enfin le thalle ramifié.

2°) chez *Cladophora, Chaetomorpha, Rhizoclonium*, l'embryospore donne directement une cellule basale à rhizoïde, et une cellule apicale, initale du thalle dressé. La paroi cellulaire, après étude de l'organisation moléculaire de la paroi glucidique par radiocristallographie et microradiographie, montre un dualisme chez les Cladophoradées. La paroi a une structure lamelleuse avec orientation définie des cristallites, chez les *Cladophora*, tandis que *Urospora, Acrosiphonia, Spongomorpha*, montrent une substance membranaire à cristallisation défectueuse, sans orientation privilégiée des cristallites. L'appareil plastidial est archéoplastidié chez *Acrosiphonia*, tandis qu'il est mésoplastidié chez *Cladophora, Chaetomorpha*. De même structure des pyrénoïdes, et mode de cloisonnement permettent de séparer *Cladophora* d'*Acrosiphonia, Spongomorpha*, et *Urospora*. Les cycles de reproduction se révèlent digénétique hétéromorphe chez *Acrosiphonia* (alternance entre *Acrosiphonia spinescens* et *Codiolum petrocelides*), chez *Spongomorpha lanosa* (alternance entre *Chlorochytrium inclusum* et *Spongomorpha*) comme chez *Urospora*. Ces ensembles de faits et d'observation, conduisent l'auteur a créer une nov. famille des *Acrosiphoniacées* (avec les genres *Acrosiphonia, Urospora* et *Spongomorpha*), famille qui constituera l'ordre nouveau des *Acrosiphoniales*. Cet ordre, sans affinités, avec les Cladophoracées vraies, se rapproche de celui des Ulothricales, tandis que la famille des Cladophoracées prend place dans les Siphonocladales.

P. Bourrelly.

Joyon L. — Contribution à l'étude cytologique de quelques Protozoaires flagellés. — *Ann. Fac. Sc. Univ. Clermont-Ferrand*, n° 22, *Biol. anim.*, 1, 96 p., 18 fig., 37 pl., 1963.

Malgré son titre voici un mémoire qui intéresse vivement les algologues car les « Protozoaires » qui y sont étudiés sont pour la plupart des Protophytes.

Sur 96 pages grand format du texte, 52 sont consacrées à des algues, le reste se rapportant à des flagellés incolores véritablement protozoaires : *Proteromonas* et *Trichomonas*.

L'auteur étudie d'abord par les techniques classiques de la cytologie en microscopie optique, puis par des coupes en microscopie électronique, les organismes suivants :

1° Chrysophycées : *Hydrurus fœtidus* et *Dinobryon divergens*.

2° Volvocales : *Volvox aureus, Hematococcus pluvialis* et *Stephanos sphaera pluvialis*.

3° Cryptophycées : *Cryptomonas* sp. et *Chilomonas paramecium*.

Source MNHN P

Signalons simplement quelques unes des observations les plus importantes : l'auteur chez *Hydrurus* compare la cytologie des cellules du thalle à celle des zoospores ; il montre que les dictyosomes des cellules végétatives se condensent en appareil parabasal chez la zoospore. Celle-ci n'a qu'un fouet unique, mais 2 blépharoplastes dont l'un est incontestablement un organite rudimentaire reste d'un deuxième flagelle.

Chez *Dinobryon* le photocepteur montre une curieuse coaptation avec le stigma.

Chez les *Volvocales* les blépharoplastes sont reliés par un double système fibreux. Une série de très bonnes photographies précisent la structure interne des pyrénoïdes, des Chrysophycées et des Volvocales.

Chez les *Cryptomonas* : l'amphosome de Hollande est un pyrénoïde typique.

Le stigma des Volvocales est formé par des granules de carotène disposés régulièrement entre les lames des bords du plaste. Chez les Cryptomonadines du genre *Chilomonas*, l'auteur décelle la présence d'un leucoplaste. Il précise la formation extraplastidiale de l'amidon et mel en évidence un sac périplastidial en relation avec la membrane nucléaire.

De lecture facile, ce travail très clair, très précis, accompagné d'une bibliographie abondante, d'une illustration remarquable, fait une synthèse de nos connaissances en Cytologie comparée pour les trois groupes de Phytoflagellés étudiés.

Il nous reste à souhaiter qu'un jour, les Euglènes, les Dinophycées, les Chloromonadines fassent l'objet d'un mémoire complémentaire.

P. Bourrelly.

Kamat N. D. — Chlorophyceae of Ahmedabad, India. *Hydrobiologia*, 20, 3, 1962.

Etude floristique des Chlorophycées (Volvocales à Desmidiées inclus), d'une région de l'Inde occidentale.

L'auteur signale 126 taxa dont 18 nouveautés appartenant aux genres : *Bulbochaete*, *Oedogonium*, *Oedocladium*, *Oocystis*, *Actinastrum* (nous pensons qu'il s'agit simplement d'une petite forme de *Coelastrum*), *Spirogyra*, *Sirogonium*, *Cosmarium*. Signalons la présence de *Pithophora* et de *Fritschiella*.

P. By.

Kornmann P. — Der Lebenszyclus einer marinen Ulothrix-Art. — *Helg. Wiss. Meeresunt.* 8/4, pp. 357-360, 1963.

Observations sur des cultures d'*Ulothrix* maintenues dans des conditions diverses.

Existence d'un stade rappelant par sa forme un *Codiolum*. Comparaison avec les travaux antérieurs.

M. Dz.

† Kuckuck P. — Ectocarpaceen-studien VIII. — *Helg. Wiss. Meeresunt.* 8/4, pp. 361-382, 1963.

Dernière partie de la publication par les soins de P. Kornmann, des notes manuscrites sur les Ectocarpacées laissées par Kuckuck.

L'ensemble doit être réimprimé séparement par l'éditeur dans quelque temps.

M. Dz,

Source MNHN, Paris

KUMAR H. D. — Observations on the developmental variability of *Camptylonema lahorense*. — *Hydrobiologia*, **20**, 4, 1962.

L'auteur cultive cette Cyanophycée et étudie les variations morphologiques en les comparant avec le polymorphisme de l'algue dans la nature.

En culture les fausses ramifications simples ou geminées sont très fréquentes, tandis qu'elles sont fort rares dans la nature. Pour l'auteur ce genre doit être placé parmi les *Scytonematacées*.

Remarquons que DESIKACHARY dans son volume *Cyanophyta* (1959) place *Camptylonema lahorense* dans le genre *Camptylonemopsis* et dans les Scytonematacées, tandis que le nom *Camptylonema* est réservé pour les espèces présentant de vraies ramifications.

P. BY.

LACKEY J. B. — Three new colorless Euglenophyceae from marine situations. — *Arch. f. Mikrobiol*, **42**, 1962.

L'auteur décrit une nov. sp. de *Sphenomonas*, une nov. sp. d'*Entosiphon* et le nov. gen. d'Euglenien Péranématacée : *Pentomonas*.

Ce dernier a contour pentagonal, à section en trapèze, possède 3 ou 4 épines marginales, un fouet unique et un noyau placé au voisinage du cytopharynx.

Les 3 organismes vivent dans les eaux marines, sur des fonds de vase ou de sable.

P. BY.

LUND J. W. G. — Unsolved problems in the classification of the non-motile Chrysophyceae with references to those in parallel groups. — *Preslia*, **34**, 1962.

L'auteur montre les grandes difficultés que rencontre la systématique des Chryophycées non flagellées. Il souligne entre autre l'imprécision de certains termes : palmelloïde, division végétative, autospores, etc., dont le sens varie avec les auteurs.

Le but de cette note est d'attirer l'attention sur des points bien précis qui méritent de nouvelles observations et de nouvelles études qui permettrons, espérons-le, d'arriver à une classification plus rationnelle.

P. BY.

LUND J. W. — A rarely recorded but very common Bristish Alga, *Rhodomonas minuta* Skuja. — *British Phycol. Bull.*, **2**, 3, 1962.

L'auteur étudie avec beaucoup de soins la morphologie et la cytologie d'une petite Cryptomonadale, abondante dans les lacs de la région de Windermeere. Cette espèce de petite taille : 5-20 μ, passe souvent inaperçu malgré son abondance. Les variations de taille, la périodicité de *Rhodomonas* sont suivies pendant plusieurs années. On note comme production massive, maximale jusqu'à 3-4 millions de cellules par litre. La croissance maximum est observée pendant la période estivale, le minimum se tient en hiver et en automne. Cette croissance ne semble pas liée ni à la température, ni l'oxygène, ni aux sels dissous, elle reste complètement inexplicable.

P. BY.

Source MNHN, Paris

MARGALEF R. — Registro fósil de fluctuaciones climáticas de corto periodo en el área pirenaica y en época miocénica. (Act. 3° congr. intern. estud. pirenaicos, Gerona, 1958). — *Inst. estud. piren. Zaragoza*, 1962

L'auteur étudie les variations de taille de la Diatomée : *Melosira islandica* var. *helvetica* dans le miocène lacustre de Cerdagne. Il obtient des courbes plurinodales avec de grandes différences pour des couches distantes de 0,5 mm. Ce sont là des variations annuelles de taille, les diatomées d'été étant plus petites que celles d'hiver. On peut donc considérer qu'une année correspond à un sédiment de 1/2 à 1 mm. De plus on trouve des variations plus ou moins régulières pour une épaisseur de sédiment de 1 cm. Cette oscillations correspondant à une période de 10 à 20 ans parallèle à des oscillations climatiques.

Ce phénomène de période de 10 à 20 ans est connu chez les sédiments diatomiques récents des lacs suisses.

P. BY.

MATTOX K. et BOLD H. C. — Phycological studies III, the taxonomy of certains Ulothrichacean Algae. — *Univ. Texas publ.*, n° 6 222, 1962.

Les auteurs étudient une série d'Ulothricales obtenues en culture de sol. Ils précisent les limites des genres *Ulothrix*, *Uronema*, *Hormidium* et *Stichococcus*. Pour les auteurs, le genre *Uronema* doit être supprimé et entrer dans le cadre d'*Ulothrix* dont la diagnose est quelque peu modifié; ils proposent quelques nov. comb. et décrivent 3 nov. sp. d'*Ulothrix*. L'*Ulothrix subtilissima* Rabenh est transféré dans le genre *Hormidium*. Les auteurs précisent la diagnose d'*Hormidium* et de *Stichococcus* et indiquent les caractères physiologiques et systématiques des algues étudiées en culture.

Excellentes illustrations en photographie et en figures au trait (57 figures et clichés photographiques).

P. BY.

MIGNOT J. P. — Quelques particularités de l'ultrastructure d'*Enlosiphon sulcatum*, flagellé Euglénien. — *C. R. Acad. Sc. Paris*, 257, 1963.

Cette trop courte note nous révèle la complexité extraordinaire de cet Euglénien incolore.

Le siphon est constitué par 3 baguettes à section triangulaire, baguettes formées d'un faisceau de fibres tubulaires réunies entre elles par 6 fibrilles rayonnantes.

Les 2 fouets ont chacun 2 blépharoplastes, de plus ils sont très épais et en plus des fibrilles classiques, portent une sorte de cordon qui double le fouet. Ce cordon est différent chez les deux fouets. Il y a donc là pour les fouets et le siphon un ensemble structural vraiment particulier.

P. BY.

Source MNHN Paris

PITSCHMANN H. — Vorarbeiten zu einer Monographie der Gattung *Heterococcus*. — *Nov. Hedwigia*, 5, 1963.

L'auteur nous donne une monographie des nombreuses espèces d'*Heterococcus* obtenues dans des cultures de sols de divers pays. 10 espèces d'*Heterococcus* étaient connus grâce aux travaux de VISCHER. L'auteur décrit 35 espèces nouvelles.

Pour chaque espèce il donne une diagnose très complète accompagnée d'illustrations où figurent la plante en culture normale, âgée de 14 jours, les zoospores et les germinations de l'âge de 4 jours, enfin l'algue sur milieu glucosé à 1 %, à l'âge de 14 jours. Pour permettre une détermination plus sûre de ces algues, l'auteur donne une clef de détermination très complète renfermant les espèces nouvelles et les espèces anciennement reconnues.

Il sépare les formes prostèes des formes érigées (en culture). Ces dernières, les plus nombreuses, sont divisées en 2 groupes paucicellulaires et multicellulaires. Cet important travail, fort bien illustré, précis et concis, rendra de grands services aux spécialistes des algues du sol.

P. BOURRELLY.

PRINGHEIM E. G. — Farblose Algen, ein Beitrage zur Evolutionsforchung. — *G. Fischer Verlag*, 471 p., 80 fig., 1963.

Cet imposant ouvrage est une véritable somme de nos connaissances sur les algues incolores. De plus il est l'œuvre d'un des promoteurs des cultures pures d'algues et l'auteur éclaire les problèmes difficiles qu'il expose grâce à son expérience de physiologiste et de systématicien. Souvent les travaux de physiologie manquent d'intérêt pour le systématicien et vice versa. Ici au contraire, nous avons une symbiose féconde entre systématique et physiologie.

Ce volume se divise en 6 chapitres :

1°) introduction avec généralités, historiques, méthode de culture et problèmes posés.

2°) Morphologie : rappel détaillé et très moderne de la morphologie cellulaire, de la cytologie; plastes, pigments, chondriosomes, réserves, structure des fouets, stigma, apochlorose.

3°) Taxinomie : généralités, puis étude détaillée des algues incolores des grands phylums : Cyanophycées, Bactéries, Sulfo-organismes, Chrysophytes, Cryptophycées, Euglèniens, Chloromonadines, Dinophycées, Chlorophycées, Rhodophycées.

4°) Physiologie : nutrition, sources de carbone, d'azote, nutrition animale, sexualité.

5°) Ecologie : avec symbiose, parasitisme, chimiotaxie, phototaxie, géotaxie.

6°) Les processus d'apparition des algues incolores.

Une très abondante bibliographie de 30 pages, une liste des auteurs cités, un index alphabétique des espèces étudiées complètent le volume. La simple lecture de cette table des matières (que nous avons pourtant abrégée) suffira à montrer la richesse documentaire et tout l'intérêt de cet important ouvrage, qui est fondé à la fois sur la connaissance parfaite des travaux antérieurs et sur la longue expérience et les recherches personnelles originales de l'auteur.

P. BOURRELLY.

Source MNHN, Paris

PUISEUX-DAO S. — Recherches biologiques et physiologiques sur quelques Dasycladacées en particulier le *Batophora Oerstedii* et l'*Acetabularia mediterraena*. — Thèse de la Fac. Sc. Paris, 1960, *Rev. Gen. Bot.*, 1962.

L'auteur a cultivé en laboratoire l'*Acetabularia mediterranea* provenant des côtes françaises et le *Bathophora Oerstedii* venant des Antilles.

L'ouvrage se divise en 5 chapitres :

1° les généralités, 2° cycle biologique des deux algues, 3° cycle nucléaire, 4° nutrition des algues en cultures, 5° fonctionnement du noyau quiescent.

L'auteur suit le cycle complet des algues en culture et montre la grande affinité cytologique des *Bathophora* et d'*Acetabularia* malgré les différences structurales.

Le noyau primaire, unique, de très grande taille (plus d'un dixième de mm) est caractérisé par d'énormes nucléoles en filament épais qui produisent dans le suc nucléaire de nombreuses gouttelettes.

Ces gouttelettes filtrent dans le cytoplasme par les pores de la membrane. Il semble que cette sécrétion, influencée par la photosynthèse, entravée par l'obscurité, perturbée par la ribonucléase, est constituée par des ribonucléo-protéines. Le noyau primaire est polyploïde; dans les jeunes germinations on assiste à une série d'endomitoses qui multiplient les chromosomes et les nucléoles.

La jeune plante donne un thalle siphoné à noyau unique basal puis elle produit, après division nucléaire, de nombreux cystes à petits noyaux diploïdes; les cystes donneront par germination des thalles normaux où le noyau deviendra polyploïde. Par le même processus se forment des zoospores végétatives à 2 fouets et un noyau ainsi que des gamètes après méiose.

Une légère anisogamie caractérise la fusion sexuelle.

Les cultures des deux Dasycladacées montrent que ces algues ont besoin, comme source d'azote, d'acides aminés et d'amides. Les nitrates et surtout les sels ammoniacaux sont toxiques.

L'auteur précise aussi la cytologie de ces algues, aussi bien en microscopie optique qu'au microscope électronique.

Comme on le voit, ce mémoire, fort bien illustré, explique de façon nette, le cycle des Dasycladacées, et le mystère de ces siphonées uninuclées dont le gros noyau végétatif n'est en quelque sorte que la somme de petits noyaux.

P. BOURELLY

RATHSACK-KUNZENBACH R. — Zur Cyanophyceenflora der Westküste von Rügen I. — *Inter. Rev. Ges. Hydrobiol.*, **46**, **4**, pp. 653-663, 1961.

L'auteur publie une intéressante étude systématique avec remarques écologiques des Cyanophycées de la côte allemande de la Baltique.

Elle découvre 33 espèces croissant dans une eau à 8 ‰ de sel : elle donne de précieux renseignements sur l'exposition des algues et leur périodicité.

P. BY.

Source : MNHN, Paris

RIETH A. — Das Akinetenstadium von *Vaucheria*. — *Monatber. Deutch. Akad. Wiss. Berlin*, 4, 8, 1962.

— Uber Gongrosira dichotoma Kütz. und Asterosiphon Dang. — *Limnologica (Berlin)*, 1, 3, 1962.

L'auteur retrouve le *Gongrosira dichotoma* Kütz. et montre à l'aide de culture qu'il s'agit bien de l'*Asterosiphon* de Dangeard. Il suit le développement complet de l'algue. Il faut cependant intercaler dans le cycle de développement la présence de spores amiboïdes que DANGEARD (le Botaniste, 31, 1941) a signalé et décrit.

L'algue doit s'appeler : *Asterosiphon dichotomus* (Kütz.) Dang. Il s'agit d'une Xantophycée proche des *Vaucheria* (mais sans sexualité) et de *Botrydium*. P. BY.

SCHLUTER M. — Die Diatomeen Gesellschaften des Naturchutzgebites Strausberg bei Berlin. — *Int. Rev. Ges. Hydrobiol*, 46, 4, pp. 562-609, 1961.

Etude phytosociologique et écologique des Diatomées d'une tourbière alcaline, suivant la méthode de BRAUN-BLANQUET. L'auteur signale 232 espèces et 100 var. de Diatomées. Il distingue 3 alliances : eaux courantes, (avec deux associations), marais eutrophes (2 associations); groupements aérophiles (3 associations).

De longues listes indiquent la composition de ces groupements avec indication de l'abondance et des conditions écologiques. P. BY.

SODERSTRÖM J. — Studies in *Cladophora*. — *Bot. Gothoburg*, 1, *Act. Univer., Gotherburg.*, 1963.

Ce mémoire de 147 pages soigneusement illustré par 125 figures est une excellent révision des *Cladophora* de l'Atlantique Nord de l'Europe.

L'auteur étudie 15 espèces avec beaucoup de soins. Il accorde une très grande valeur systématique à la taille des cellules.

Pour chaque espèce, il établit un diagramme fondé sur les mesures de longueur et de largeur de 100 cellules. Ces mesures sont portées sur un graphique. On a ainsi pour chaque espèce un essaim de points dont la répartition dans le graphique est caractéristique d'espèce. Une clef dichotomique de détermination des 15 espèces, utilise à la fois les dimensions cellulaires et les caractères donnés par les rhizoïdes, le mode de ramification, la couleur, l'écologie. Tous les algologues savent combien il est difficile de déterminer certaines espèces de *Cladophora*. Dans ce genre les critères systématiques semblent évanescents et les caractères sont tellement variables qu'il est souvent impossible de tracer les limites d'une espèce.

L'auteur, avec sa méthode originale de mensurations, nous apporte donc un grand espoir. Il faut souhaiter que cette méthode soit appliquée sur le plus grand nombre d'espèces possible afin d'en éprouver la constance et d'en vérifier l'efficacité. P. BOURRELLY.

Le Gérant : R. LAMI. — IMP. MONNOYER, LE MANS.

BIB. MUS. D'HIST. NAT. N.

Source : MNHN, P